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MOUNTAIN PASSES: A STUDY IN ANTHROPO-GEOGRAPHY.*

BY

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We now come to the pass city, which is situated in the plains or lowlands at the foot of a pass, and which draws its support both from mountains and plains. It is located on the line of travel which always skirts the base of a mountain range, at the point where this is intersected by a transverse route of communication across the highlands. The greater fertility of the plains makes for a larger centre of population, the intersection of trade routes ensures commercial activity; hence such points offer conditions for large and flourishing cities, especially if railroads follow the two lines indicated. Such is the location of Narbonne and Barcelona at the extremities of the route over the eastern Pyrenees; Toulouse commanding the central passes, and Bayonne the western. The St. Gothard route is flanked by Lucerne on the north and Milan on the south, just as the Brenner is by Munich and Verona. Tiflis is situated in the great valley highway between the Caspian and Black Seas, but through the Pass of Dariel (7,954 ft.) to the north come the influences that make it a Russian town. Peshawar depends more upon the Khaibar Pass and its connections thereby with central Asia than upon the Indus river. Kabul, which commands the western entrance to this route, and lies on the great thoroughfare through the Pass of Bamian to Russian Turkistan, is one of the keys of India; while Kandahar, the other, occupies the point where all the routes of western and southern Afghanistan converge for the descent through the Bolan pass to the Sind. But great as is the

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commercial and strategic importance of these cities, it sinks into insignificance in comparison with that of Herat, which commands the Heri-Rud depression leading down to Turkistan. In the twelfth century, according to a Persian historian, it had 444,000 houses and 12,000 shops. It has been attacked and destroyed fifty times, each time rising from its ruins. The Russians plan eventually to make it the terminus of the Trans-Caspian Railroad.

Where mountains follow a semi-circular course, the routes over their passes must tend to converge on the inner side. Such foci of highways are the fore-ordained sites of great commercial centres. The bazaars of Merv are fed by all the mountain routes from Meshed in Persia to Kabul in eastern Afghanistan.' Khulm and Balkh draw on all the twenty or more passes over the Hindu-Kush and the Pamir, Bukhara is the focus of all the southern routes on which, in relation to itself, Merv and Khulm are only intermediary points; while with Samarkand and Tashkent it shares a position before the great valleys of the western Tian-shan. Its location would make it one of the great cities of the world were it not for the encircling desert and the scantiness of its water supply, which is tapped further up stream for the irrigation of Samarkand. In its bazaars are found drugs, dyes, and teas from India; woven goods, arms, and books from Persia; arms and fine horses from Merv; wool, skins, and dried fruit from Afghanistan, and Russian merchandise from Moscow, Nijni-Novgorod, and Orenburg. English goods, which formerly came in by the Kabul route, have been excluded since Russia established a protectorate over the province of Bukhara. Just across the highlands of central Asia, to the east, the cities of Kashgar and Yarkand occupy the centre of the vast amphitheatre formed by the Tian-shan, the Alai-tag, the Pamir, Hindu-Kush, and the Kuen-lun. Stieler's atlas marks no less than six trade-routes over the passes of these mountains from Kashgar to the head streams of the Oxus and Sir-daria, and six from Yarkand to the Oxus and the Indus. Their position is parallelled by that of Turin, which occupies the focus of all the roads over the central, western, and Ligurian Alps, commanding thus a fine sweep from Lucerne in the north around to Savona in the south.

The location of Turin is superior to that of the central Asiatic cities mentioned above, because the passes which it commands unite the two great natural waterways found in the Rhone and the Po. The accessibility, the sphere of attraction, and hence the value of all mountain passes, is determined in large part by their connection with the natural highways which are found in river

basins. The passes of the central Asiatic highlands lose much of their importance by a lack of waterways. Of the streams draining this vast upheaved area the Oxus, Sir-daria, Chu, and Ili are lost in land-locked seas or lakes; the Tarim is soaked up by the sands of the desert, and only the Indus, which merely skirts the base of this highland on its most inaccessible side, reaches the ocean. In contrast, the Alps are flanked by the Po, the Rhone, and the Danube. The passes of the Pyrenees open on one side into the valley of the Ebro, and on the other to the Garonne, with its canal extension to the Mediterranean. The Pass of Belfort is the greatest historic highway of Europe, because it unites the deep furrows of the Rhine and the Rhone. The passes of the Alleghanies, in western Pennsylvania, lead through their pass valleys to the Ohio at its head of navigation. The Mohawk depression connects the Hudson with the inland waterway of the Great Lakes, and hence, in its historical and commercial importance, is one of the most significant natural features on the North American continent. Even the far-away Yukon serves as a highway from the northern outlets of Chilkoot and White Horse Pass to the goldfields of Dawson City and Forty Mile Creek.

As the world's roads are used primarily for commerce, pass routes rank in importance according to the amount of trade they forward, and this in turn is decided by the contrast in the lands which they unite. The passes of the Alps and the Pass of Belfort are busy thoroughfares, because they effect the exchange of the products of the tropical Mediterranean and of the temperate regions of central Europe. Or, the contrast may be one of occupation. The Mohawk depression forwards the grain of the agricultural Northwest in return for the manufactured products of the Atlantic cities. The passes of the Asiatic highlands connect the industrial lowlands of India and China with the nomad uplands of Mongolia, Afghanistan, eastern Bukhara, and Russian Turkistan. Hence they facilitate the exchange of the wool, skins, camel's hair cloth, and metal work of the wandering pastors for the manufactured goods and fine agricultural products of the sedentary populations in the fertile lowlands. Where passes offer an outlet for inland countries to the sea, their sphere of attraction, and therewith their importance, is immensely increased. San Francisco, New York, Philadelphia, Marseilles, Venice, Trieste, and Karachi are seaports which owe their importance in no small degree to the great passes back of them.

Though mountain passes are pre-eminently thoroughfares for

trade, and though the purposes of trade have lent their settlements a certain common physiognomy, nevertheless war, too, has had a hand in modifying the work of nature there in making military roads and building forts, and in giving to the history of mountain passes the element of adventure to vary the monotonous tale of trade. The final ascent to the summit of high passes is oftentimes made through wild, narrow ravines, which present the greatest difficulties to the advance of an army, and predetermine the point of bitterest aggression and defense in time of war. Such is the gorge of Valsorey leading up to St. Bernard, where Napoleon encountered the greatest difficulties in his famous passage of the Alps in May, 1800, with 30,000 men; such the gorge of Cardinel, just below the Splügen Pass, where the French army, under General Macdonald, ascending this ravine in December, 1800, was struck by an avalanche, and lost a large number of its men, who were hurled into the abyss below. When Suvaroff, in September, 1799, crossed the Alps to drive the French out of Switzerland, he came up the Ticino to the dangerous Val Tremola (6,375 ft.), where he had several sharp skirmishes with the enemy, crossed the St. Gothard, forced the passage of the Urner Loch, but had a fierce fight at the Devil's Bridge, at the lower end of the gorge, and compelled the French to retreat to Lake Lucerne. Just six weeks before the Devil's Bridge had been the scene of a battle between the Austrians and French.

The same military exploits have been enacted over and over in mountain passes. The gaps in the Hindu-Kush and the Sulaiman ranges have been traversed by the conquering forces of the early Aryans, Alexander and his Greeks, Mongols, Tartars, Persians, and English; and now the Russians are ready to descend by the same routes to the Indus. Every foot of the Khaibar Pass has been fought over repeatedly, and the Ali Musjid fort, which guards it now, has been alternately held by Afghans and English. In the pass of Roncesvalles, leading across the western Pyrenees from Pamplona to St. Etienne, fell the army of Charlemagne in 778 with the flower of his knighthood; through this valley the Black Prince in 1367 led his troops to the victory of Navarrete; up this valley in 1813 moved a division of Wellington's army, driving the French before them; and by this route Soult advanced across the frontier from France for the relief of the French forces shut up in Pamplona. In the eastern Pyrenees, the Col de la Perche saw the legions of Hannibal, of Pompey, of Cæsar climbing the mountain barrier, and the repeated advance and withdrawal of French forces in the Peninsular War.

Military needs have given a certain common physiognomy to mountain passes. Artificial defences of every kind guard the approaches to the summit. Forts, castles, watch-towers, mount the heights of almost every gap in the southern Eurasian highlands from the Bay of Biscay to the Bay of Bengal. A more archaic form of defence is found in the ruins of walls built across these natural portals. The old Caucasian wall was built across the Albanian Gates in the eastern Caucasus by the Persians as a barrier to barbarian invasion from the north, and was provided with iron gates by Harun al Rashid. Strabo says that in his day the *Pylæ Caucasiæ*, or Pass of Dariel, was closed by walls and gates. The Shah el Nadir, leading from the mountains of northern Persia to the plains of Turkistan, shows formidable walls to-day. The Afghans, in their recent war with England, threw temporary barriers across the Khaibar Pass to block the advance of the English. Compare Cæsar's wall and trench, nineteen miles long, which he constructed across the depression between Mt. Jura and Lake Leman to stop the advance of the Helvetians. At the entrance to passes we find strongly fortified and garrisoned points as a base of supplies for aggression or defence in time of war. Such are Belfort, Stirling (which is the key to the Scotch Highlands); Vladikavkaz, at the entrance to the Pass of Dariel; Saverne (the Roman *Tres Tabernæ*), which defends the chief pass of the Vosges; Bayonne and Perpignan, both their fortresses the work of Vauban, which guard the eastern and western passes of the Pyrenees. Quetta, which is the chief British stronghold in the Sulaiman Mountains, is at the western outlet of the Bolan Pass, leading up from the Indus Valley; it also commands a route running west by the Kojah Pass to Kandahar, and another running north to Kabul. Some old towers standing in the vicinity of Quetta and at the entrance to the gorges attest the importance attached in all ages to this strategic position. Farther north Peshawar is the base of all military operations over the neighboring Khaibar and Paiwar Passes into Afghanistan, and northwest by the Chitral route to the passes of the Pamir.

Defensive war goes to meet the invading enemy at the frontier, and if this frontier is mountainous, the passes see the first engagements. Such was the battle of Thermopylæ. The low passes forming the outer gateways into the mountains of Switzerland have been the field of battles, small in point of the numbers engaged, but great in their significance. At Morgarten Pass, east of Lake Zug, in 1315, fourteen hundred Swiss Confederates won their first battle over their Hapsburg oppressors; and again in the same place

in 1798 the army of the Swiss Republic defeated the invading French. This spot has rightly been called the Thermopylæ of the Swiss. The battles between the Swiss and Austrians in 1386 at Sempach, which commanded an approach to Lucerne, and in 1499 at Frastanz, just south of Lake Constance, in defense of the entrance to the Upper Rhine, were of this same character. It was in the Pass of Killiecrankie that the Highland clans, supporting the deposed James II. of England, made their stand in 1689 against the army of William I. Stirling Castle, Falkirk, and Bannockburn—names great in the history of English invasion and Scotch defence—guarded the pass from the Lowlands to the Highlands.

Where the invading force succeeds in crossing the mountain barrier, it advances out of the mouth of the passes and in the plains meets the full force of the defending army—not a mere outpost, such as is often sufficient to hold a pass. Such plains, generally river valleys, from the topography of the country, become the great battle-fields of the world. It is safe to say that no other equal area on the earth has seen so many pitched battles as the valley of the Po. On its affluents, the Ticinus and the Trebia, Hannibal defeated the Roman consuls. Just west of the Ticinus at Vercellæ, Marius defeated the invading Cimbri. Five hundred years later Stilicho defeated the Goths under Alaric, who had invaded Italy by the Julian Alps, at Verona and Pollentia, two widely separated places, of which the latter commanded the entrance of the low pass south over the Ligurian Alps, now followed by the Ceva-Albenga road. In the Middle Ages, when the German Empire was trying to retain its hold on the Kingdom of Italy, the Po valley was the scene of conflicts. But this region saw its greatest conflicts when Napoleon, in May, 1800, brought his army across the Alps by the St. Bernard, the Simplon, St. Gothard, and other passes descended upon the enemy like a thunderbolt, and defeated them at Montebello and Marengo. The next few decades saw the battles of Novara, Magenta, and Solferino stain the streams of the Po. In the annals of Spain the valley of the Ebro affords a parallel to the Po in Italy. Any one who reads Napier's History of the Peninsular War sees that the activities in that great conflict were completely dominated by the passes of the Pyrenees. The first move on the part of the French was to seize all the Spanish piedmont, or mountain fortresses, like San Sebastian, Vitoria, Pamplona, Jaca, Figueras, and Barcelona, while the defences of Gerona were hammered at again and again to reduce that important point. Their communication with France secured by the possession of the passes,

the French moved forward to the Ebro, and then, in the eight years that followed, every foot of the Ebro from its source to the mouth was contested. When in the last period of the war the French began to give way, they made their last line of defence along the Ebro, whose waters ran blood once more. On their retreat over the passes across the frontier, the rivers of France—the Bidassoa, the upper Adour, and Garonne—repeated the history of the Ebro. Wellington's wonderful crossing of the tidal stream Bidassoa, the fall of the French cities Bayonne, Orthez, Tarbes, and Toulouse, placed the last eventful scenes of the war along these river valleys.

All mountain regions, like Afghanistan, the Caucasus, the Alps, and the Pyrenees, along whose base or over whose passes the great human tides of migration, trade, and war have poured, contain a motley assemblage of races, languages, dialects, customs and institutions in apparently hopeless confusion, in which, however, the anthropogeographer is able to detect an orderly arrangement. Especially is this true in the passes which have played a great part in ethnic and linguistic distribution. The fair and red-haired Teutonic type of Switzerland, limited in general by the crest of the Bernese Oberland and the Todi chain, extends south of this line in a broad but shallow wedge to the summit of the St. Gothard and Furka passes, while just beyond begins the dark Italian type and Italian speech. The Brenner, too, carries the German speech and greater height of the Teutons well over into the Adige valley as far as Bozen, where the stunted type of Mediterranean people and Italian speech begin. The lowlands on either side of the Alps are inhabited by two distinct long-headed races, the summits and remote upland valleys by the broad-headed Alpine race; the people of the pass show a cranial index intermediate between the two, indicating the intermixture of races which has taken place along this thoroughfare. The inhabitants of the Brenner are pretty much alike from Innsbruck to Bozen in cranial index, stature, coloring, and language; but remote side valleys show the unmixed Alpine race with every variety of dialect, custom, and social institution.

The passes of other mountain ranges have the same ethnic story to tell. The Pass of Belfort connects the tall, blond Germans of the Rhine with a long, narrow area of this same type, extending through this depression and down the Rhine to Marseilles and dividing two wider sections of the short, dark Alpine race. It has also exerted a marked influence on the natural history of Europe; it was the only route by which the southern flora and fauna could reach the north, since they could not cross the Alps. The two

extremities of the Pyrenees, where, as we have seen, are the best passes, show the same race of inhabitants on both the slopes. The province of Roussillon, in southern France, which commands the eastern routes to Spain, was annexed to France only in 1659. Its capital, Perpignan, in plan and architecture, is semi-moresque; and the inhabitants, in physiognomy, language, and dress resemble the neighboring Catalonians in Spain. At the other end of the Pyrenees, the Basques, whose predominantly long-headed type seems to point to their origin in Spain, occupy both slopes of the mountains; but the broad-headed Alpine race, native to southwestern France, has sent a deep wedge of its broad-headed type up the valley of the Nive and over the Pass of Roncesvalles as far as Pamplona, displacing the cranial index of the Basques, but adopting their language. In the Caucasus, the Ossetes, who hold the Pass of Dariel, are the only tribe occupying both slopes. The pass city Tiflis, at the crossroads of the two great routes between Europe and Asia, has been called the "precipitate of history." Prof. Brusch reckons seventy different languages spoken there. The great pass cities of central Asia, like Bukhara, Merv, and Tashkent, show the same feature of mixed population, embracing representatives from every country of Asia and from many of Europe, including always the ubiquitous Jew.

Those points on the earth's surface which attract the chief activities of man—travel, territorial expansion, migration, war, and commerce—must early assume political importance. Tribes inhabiting mountain passes have always been able to exert a political influence out of proportion to their size and strength; and they have also been the object of conquest by the people of the lowland. Entrenched in their mountain fastnesses, however, they have always been able to give the invaders plenty to do before the conquest has been accomplished. An old Persian proverb says: "If the Shah is too mighty, let him only make war on the Caucasus." Such mountain tribes have always exploited the advantages of their position by levying tolls. Cæsar describes a certain expedition he sent out under the command of his lieutenant to reduce three mountain tribes whose territories extended from Lake Geneva and the Upper and Middle Rhone to the summits of the Alps, and who controlled the passes traversed by the Roman merchants, *magnis portoriis et magno cum periculo.* The southern slopes of these mountains were occupied anciently by the Salassi, a Celtic tribe, who inhabited the valley of the Upper Dora Baltea and Buttier, and hence commanded the passage of the Great and Little St. Bernard,

the two most important routes from Italy to Gaul. They frequently harassed the Romans, and on one occasion plundered the coffers of Cæsar himself. After a protracted struggle this tribe was exterminated by Augustus, who founded Aosta to protect the high-roads and garrisoned it with 3,000 soldiers of the Prætorian cohorts. The Afghan tribes in the passes of the Sulaiman Mountains have been accustomed to impose high transit taxes upon traders traversing those routes between western Afghanistan and India. The travellers, therefore, organize themselves into bands of hundreds, or even thousands, as protection against attack or exorbitant exactions. The Afridis have always enforced their right to impose tolls in the Khaibar and Kohat passes. Since 1880 the English have paid them a yearly sum to keep these roads open.

Mountain regions, because of their passes, are great natural transition lands, and as such have always been the object of acquisition by neighbouring powers having designs on the country beyond. They have, therefore, assumed a peculiar political character, and have been the subject of a distinct political policy, which is only to-day recognized in its full significance—since the development of the national-empire idea and its consequent territorial expansion. This policy dictates the acquisition, not, as heretofore, of a mere border range as a frontier, but of a whole mountain region. In the military operations against the chief objective in the country beyond, the rugged highlands, with their passes, form the line of communication with the rear. It is of vital importance that this line, necessarily long, difficult, and easily obstructed at its passes, should be put beyond the chance of interruption. The whole mountain country, therefore, must be conquered. The conquest, though long drawn out, because of the independent spirit and intrenched position of the upland tribes, is a foregone conclusion. The sparsity of the highland population, their tendency, geographically determined, to form small, isolated valley States, and their lack of cohesion, make their eventual defeat certain. The small States of the Pamir, Roshan, Machan, and Shugnan have lost their independence to Russia; Afghanistan, the Chitral, and Kashmir to England. Only where the sense of danger, combined with an advanced civilization, overcomes the tendency towards disunion, as is the case of the Swiss, do we find a mountain people successfully maintaining an independent State. The Alps succumbed to ancient Rome, the Tyrol to the early German Empire. Napoleon I. conquered Switzerland, and began constructing military roads over the chief passes to Italy. By the second Afghan War, the Amir became

a feudatory of the British Crown, which gained control of the foreign relations of Afghanistan, and also of its great pass routes—the Khaibar, Kohat, Kuram, and the Bolan—to Kandahar.

In all of the cases cited, military or political exigencies pointed out the necessity of securing these transition lands; but, in the history of our own country, we have an instance of the occupation of such mountain districts purely as the result of the long-sighted prevision of America's first expansionist. The man was Gov. Spotswood, of Virginia. In his time the tide-water marked the limit of English settlement. Between that and the foot of the Blue Ridge lay a fifty-mile zone of unbroken forest. The beyond was unknown. All the Mississippi valley was claimed by the French, who, in order to hold it, were pushing the construction of a line of forts, reaching from New Orleans up to Detroit and Fort Duquesne. Rumors of these activities reached Gov. Spotswood, and his mind was disturbed by the cordon the French were drawing around the English settlement. So in 1716, by way of example, apparently, he made his famous expedition across the Blue Ridge by Swift Run Gap, from the headwaters of the Rapidan into the Shenandoah Valley, of which he took formal possession in the name of the King. In his letters to the Lords of Trade regarding this expedition, he explains the power of the French settlements of the interior to monopolize the fur trade and also to threaten the English plantations in the rear. And then he adds:

> Nature, 'tis true, has formed a Barrier for us by that long Chain of Mountains w'ch run from the back of South Carolina as far as New York, and w'ch are only passable in some few places, but even that Natural Defence may prove rather destructive to us, if they are not possessed by us before they are known by them.

Then he recommends that, while it is yet possible, the English should make some settlements on the Great Lakes, and at the same time possess themselves of those passes of the mountains which should be necessary to preserve communication with such settlements.

The passes to and through such highlands are always the great objective. When a mountain State has effectively maintained its independence—as Switzerland has—and is conscious that its political importance is due to the roads it controls, it aims at the complete command of the entrances to its passes. Switzerland has succeeded in shutting Italy out from all her southern passes except the Great St. Bernard and the Splügen. The exclusive command of the St. Gothard route from lowland to lowland is secured by the wedge of Swiss territory which is driven down into Italy almost to

the plains of the Po. The same politico-geographical phenomenon is repeated just farther east in the southern approaches of the Brenner, again at the cost of Italy. But politico-geographical history in Europe has become old and staid, whereas in Asia it is only in process of making. In Asia, therefore, the evolution of the peculiar political character of these barrier areas is proceeding rapidly before our eyes. In this process Russia is the great factor, as a glance at the Russian frontier will show. To the political geographer the map of the Russian frontier in Asia is eloquent. Its distinguishing features are four great bulges, not so very pronounced when viewed in relation to the whole vast stretch of the Russian Empire; but when seen in detail and in relation to the topography, their significance becomes important. All four of these bulges have to do with mountain areas, and the accession of the territory has immediately been followed by the construction of a railroad—a fact which attests the importance which Russia herself attaches to the acquisition.

The only points at which the Russian territory extends south of the critical fortieth parallel are in Trans-Caucasus, Trans-Caspia, and the Pamir—all of them acquisitions of the past twenty-three years. The conquest of the Caucasus is geographically a conquest from Asia. Begun a hundred years ago, the frontier has been protruded, with slight interruption, southward over the Great Caucasus, the Anti-Caucasus, the Kazil-dagh (mean altitude 10,460 ft.), and to the still higher range forming the watershed between the Araxes and the Murad, the head-stream of the Euphrates. That name contains the climax of Muscovite expansion here. Along the Araxes basin three Powers converge—Persia, Turkey, and Russia; but Russia holds the lion's share, together with the best strategic points for descent on the Euphrates. Her outpost city is Kars, recently connected by railroad with Tiflis and with the port of Batum, on the Black Sea. Russia's objective is a port on the Persian Gulf, the commercial advantage of which would be enormous; on the political side, it would enable her to threaten the London-Calcutta highway in the flank. She is stamping upon the Armenian plateaux, therefore, the character of a political passway to the Euphrates, by which she hopes some day to reach the sea. If thwarted in this endeavor, she will utilize Afghanistan or Persia, and to this end is incidentally trying to gain ascendency in the councils of the Shah.

This brings us to the second bulge in Russia's frontier. The first stretch of the Trans-Caspian railroad was built, after the con-

quest of this region in 1881, along the foot of the Hasar Meshid mountains, which form the northern border of Persia; and Askabad, because of its proximity to the Persian frontier and the carriage-road thence one hundred and seventy miles over the mountains to Meshed, was made the military headquarters of Turkistan, and provided with a strong garrison and abundant stores of every kind on a war footing. Meshed is connected by a road two hundred miles long with Herat, and is the chief city of Khorassan Province, over which Russia seems to have established an indefinite but convenient protectorate. Khorassan may prove a possible passway to the Persian Gulf; but if that fails the Russians have still the Gates of Herat. The Afghan-Russian frontier line, accepted by Russia in 1872, had its termini at Sarakhs at the northeast corner of Persia, on the Heri-Rud, and at Khoja Saleh, on the Oxus, directly east of Merv. In political documents and speeches this was assumed as the boundary till 1882, when the Paropamisus gap was discovered by a Russian explorer. In March, 1884, Merv was conquered, and then began the advance on the Gates of Herat along two lines—one from Sarakhs up the Heri-Rud, ending in the occupation of the Zulfikar Pass, the Robat Pass, and other avenues to Herat; the other from Merv up the Murghab river, which irrigates the Merv oasis, to the town of Penjdeh, which commands the approach to a much-used trade route over the eastern Paropamisus, here 8,000 ft. high, by the Pass of Hasret-i-Baba (6,400 ft.), straight to Herat. The English frontier survey commission, appointed finally to investigate the Russo-Afghan boundary, left the Muscovites in possession of the hundred and twenty miles of country they had occupied. To-day, south from Merv runs the famous Murghab branch of the Trans-Caspian Railroad for a hundred and ninety miles along the Murghab river to Kushkinski Post, on the frontier of Afghanistan, only about thirty miles from the fortress of Kushk, which guards the northern outlet of the Hasret-i-Baba Pass, and eighty miles from Herat. This is a purely strategical and military line, and is kept absolutely secret. No permission to travel on it has ever been granted to a foreigner. It is not difficult to foretell the history that will be made some day in the passes of the Paropamisus.

The next bulge in the Russian boundary is formed by the rectangle of the Pamir, which seems to have been attached by one of its corners, thus forming a very erratic frontier. The Pamir is approached by the Oxus, which Russia controls, and which by its two head-streams exactly embraces the plateau. By this acquisition,

therefore, Russia holds a strategic position for descent through its passes to northern India, or to the Tarim basin of Chinese Turkistan, with its cities of Kashgar and Yarkand. On the northern border, Russia's position is still more significant. An eastern branch of the Trans-Caspian Railroad to Margljan (2,000 ft.), in Fergana, brings Russia very near to the Tarim, for by the Terek Pass her forces can drop down from the wall of the Tian-shan into the valley of Kashgaria.

The next bulge is much more important, though much more slight; but the evidence seems to indicate that the eastward protrusion of the frontier towards the passes of the Dzungaria is only begun. It is evidently aimed at Kulja, where converge all the routes from the west to join the great imperial road of China. Now Russia demands the protectorate over Mongolia and Chinese Turkistan, for which she has been preparing her routes of communication. The main line of the Trans-Caspian Railroad runs at present only to Tashkent; but its extension to Kulja will undoubtedly be a thing of the near future.

The advance of the Russian frontier towards Afghanistan immediately succeeded a similar movement of the British in India towards strategic points to the west. India's western frontier shows a decided bulge into Afghan territory, with its apex pointed towards Kandahar, whose strategic value we have seen. Here, too, as in the case of Russia, the railroad has followed on the heels of the advance. The wedge driven westward and northward up the valley of the Chitral to the base of the Hindu-Kush in 1895 was a counter-movement, called for by Russia's occupation of the Pamir. Newspaper generals and parliamentary speakers of the time declared the Chitral a strategical position of doubtful importance, and set forth at length the impossibility of any attack from the north. But the Indian officers on the ground concluded that if Russia found it worth while to be on the Pamir side of the Hindu-Kush passes, it was at least expedient for England to be stationed at the southern entrances to the same. Thus even the "Roof of the World" has gained a political importance strangely at variance with its scantiness of resources and sparsity of population.

THE TANANARIVE OBSERVATORY.

BY

W. H. HUNT.

It is an undeniable fact that if Protestant missionaries effect in new countries a great deal apart from the mere propagation of the Gospel, as was the case in Madagascar when during the early years of the last century they introduced so many of the mechanical arts, the Jesuit missionaries stand very near the head in works demanding a knowledge of the higher sciences.

The names of the Reverend Fathers Roblet and Colin will be always as intimately associated with the great African island as that of Grandidier, the distinguished French explorer. Long before the French Government took in hand the cartography of Madagascar, the Rev. Father Roblet had completed the triangulation of the two great interior provinces of the island. For the most complete tables of meteorological observations taken in Madagascar for years before the island was attracting much notice we are indebted to the Roman Catholic Mission. By a strange coincidence, I am told when the English Government, on the occasion of the last transit of Venus, sent a scientific expedition to the west coast of Madagascar to take observations, it was a Jesuit priest, Dr. Perry, who was in charge of the Mission. From the time when, more than twenty years ago, Father Roblet had traced out an enormous ellipse, chiselled in the flag-stones of the Mission courtyard at Tananarive, forming a sun-dial by the shadow of a huge iron rod thrown out horizontally from the gables of the house, to the present day of a scientifically constructed observatory, many discoveries have been made. Those who suffer damage from the periodical cyclones which visit these parts ought to be among the foremost to appreciate the value of an observatory at Tananarive. The distinguished labors of Dr. Meldrum, of Mauritius, have done so much in that direction during the past quarter of a century and more that a sister institution on this island cannot fail to be of great advantage.

A recent number of the *Revue de Madagascar* contains an interesting short notice of the observatory at Tananarive, written by Monsieur Clique, in charge of the Press service at Tamatave, and I cannot omit to give a translation of it in English, both as a side-

light upon the two pioneers of the work in Madagascar and as also worthy of notice to the scientific world in view of the invaluable services which it may eventually render:

About a mile and a half east of the capital, on a summit of a barren hill called Ambohidempona, is seen a white cupola, having the appearance of an Arab mosque. This is the new Tananarive Observatory, the only French scientific institution of its kind in the southern hemisphere. A tortuous and difficult path leading to it brings the visitor to an elevation above the sea of 1,402 metres, or more than 4,000 feet.

The present construction is quite new, the first building having been destroyed in 1895, during the war, just before the taking of Tananarive, for it is from this mountain of Ambohidempona that the first shells were thrown into the Queen's Palace. During the course of the Franco-Malagasy hostilities most of the astronomical instruments were carried off, either by orders of the Queen and her Ministers, or they were simply stolen by the natives and sold at ridiculous prices, spoiled or rendered worthless by the fools who meddled with them. A chronometer, for instance, of extreme value, the property of the Government, lent by the Admiralty, had been sold for one dollar! When, after the conquest, they could be partly recovered, very few of the instruments were intact, and a great number had to be sent to France for repairs, to replace the stolen and lost parts. In their simplicity the Malagasy imagined that the great equatorial telescope was a menacing cannon, a terrible engine of destruction, and that its stand was the gun-carriage! Orders were given to destroy everything before the arrival of the French.

It was necessary, therefore, to think of re-erecting the building. Father Colin, the enterprising founder, and the learned Father Roblet consequently appealed to the colony for help in the work. General Gallieni very judiciously replied to them, that "The Malagasy had destroyed the Observatory and the Malagasy might rebuild it"! So, one hundred impressed labourers were assigned to the task. Father Colin himself added six skilled workmen and set to work personally, and, as had been the case with the construction of the first building, he had to be by turns architect, mason, and carpenter.

The task was one of considerable difficulty. Material was hard to procure, and forced labour left much to be desired. An observatory, in fact, is not an ordinary building. For the instruments to attain perfect precision, indispensable to astronomical observations, it had to be built in such a manner that the flooring remained isolated from the walls and the pillars supporting the telescope, which, in their turn, must be placed on bed-rock. Lime was indispensable to give the desired solidity and cohesion to the materials.

Happily the foundations of the first observatory were not destroyed. They could be used for the second, and the forced labourers had only to go to the bottom of the ravines of Ambohidempona and bring up the stones which the Senegalese soldiers had rolled down to the bottom of the mountain for fun, having nothing better to do while they were camped on the ruins after the surrender of Tananarive. The building, by dint of great labor, was completed after twelve months' work. Although not of the same proportions as its predecessor, the present Observatory is none the less an important edifice, of imposing aspect. The observatory destroyed by the Hovas consisted of a central octagon twenty-five feet in diameter. Starting from the first story, it was made circular, so as to support the large dome; on three sides of the octagon were pavilions supporting towers, each supplied with a smaller cupola. The new Observatory has only one large cupola at the end of the main building. It has cost

$2,000—a sum which the Minister of Education granted as a subsidy to the Observatory.

This money spent, there still remained the cupola to be erected, and the estimate amounted to $1,200. At this very time the Geographical Society of Paris had the happy idea of awarding the Herbert-Fournet prize to the Reverend Fathers Roblet and Colin, which allowed them to devote immediately the sum to the purchase and erection of this cupola. From that time forth the Tananarive Observatory was on the way to completion, and could maintain the good reputation it had acquired since 1889 by its important meteorological, astronomical, magnetic, and geodetic statistics furnished to the scientific world.

The transportation to Tananarive of the framework of the cupola from Majunga was beset with difficulties, the immense iron work weighing nearly five tons. Father Colin, who had not forgotten the great obstacles he had to overcome in 1890, in getting up the great equatorial telescope, had recommended it to be packed in cases weighing about 100 pounds each, but this method was not practicable with the heavy framework of the cupola. General Gallieni, therefore, decided to entrust this delicate work to the artillery corps. The sections complete were enclosed in eight cases twelve feet long, and were brought up by the Majunga road on Lefebvre carts drawn by mules, the only practicable means of transportation along the whole route. The journey required two months.

But that was not all; it was now necessary to get it up. Father Colin, aided by a single workman, set to work himself hammering into shape the strained parts, so that at the end of a month the revolving dome of the observatory was in its place and in working order. The packing of the different sections of the cupola had been done while the paint was still fresh, so that the excessive temperature of the Red Sea soon had something to say to it. Father Colin, after having been machinist, had to turn painter, and re-painted the whole cupola. The Observatory, since July, 1899, could thus resume its ordinary routine of work, so long interrupted. This does not imply that the necessary outfit for the perfect working of the Observatory is complete. Father Colin is in need of numerous instruments, and has gone to France to procure them. The Tananarive Observatory possesses, besides the large equatorial telescope which Admiral Mouchez, the then Director of the Paris Observatory, procured for it in 1890, a meridian circle which works with precision, astronomical, meteorological and magnetic instruments of all kinds—seismographic, mareographic, etc.

His favorable position allowed Father Colin, in 1891, to make one of the rare observations of the passage of Mercury between our planet and the sun by establishing the exact moment when the phenomenon took place. All the cyclones which devastated the coasts and interior of Madagascar or of South Africa can be registered; and if Father Colin had only had at his disposal a rapid means of communication with Vohemar and Diego Suarez at the time of the hurricane of *December 15th last*, he might have been able to give the parts of the country concerned most valuable warning of the storm which was threatening them.

TAMATAVE, MADAGASCAR.

THE FLORA OF ST. CHRISTOPHER.

BY

WILLIAM H. ALEXANDER.

Any attempt to describe or convey a true conception of tropical flora must be more or less unsatisfactory. Here the botanist meets with such a profusion of natural beauty, and in such endless variety, that he feels bewildered; then puzzled at the odd and fantastic freaks of nature, but at last lost in admiration for this wonderful exhibition. Although death and decomposition continually occur, yet all seems to be life, so quietly and quickly does nature repair the losses. There is, apparently, no cessation in the operation of the forces concerned in plant life. While some trees bear fruit but once a year, yet many others are ever-bearing; one may see on one tree the flower and the fruit in all stages of development, from the youngest to the ripe fruit.

This article, however, is concerned only with the Flora of St. Christopher (St. Kitts), one of the Leeward Islands of the West Indies. Although the various islands of the West Indies differ among themselves as to flora, as well as in many other respects, yet a careful study of the flora of one is a most valuable preparation for the study of the others.

Relative to the fruit trees of St. Christopher, it may be said that they abound; and the best of all is that they grow wild or spontaneously on the mountains, by the highway, along the water-courses, or in the gardens, if permitted to do so. No cultivation is required except in the case of the pine. The true value of this fact will be fully appreciated by those who know the wretched poverty of the black labourers of the island. Perhaps the bread fruit (*Artocarpus incisa*) is the most valuable of all to the natives of the island, as it literally supplies them with food—"meat and bread." The fruit resembles that of the Bois d'Arc or Osage orange, and is prepared for eating simply by boiling in salt water or by baking. For days and days many of the poorest never taste a mouthful of other food. The mango (*Mangifera indica*), with its deep foliage and beautiful fruit, is valued both for its ornamental effect and its fruit. The mango and the Avocado pear are highly esteemed as fruits. The banana and the cocoanut are also valuable fruits; there is no effort, however, to raise more than enough to supply

the local demand, as is also true of most of the fruits. The growth and cultivation of the sugar-cane constitute the one and only industry of value, commercially speaking. The cassava is valued as a bread and for the starch it supplies. In fact, the island gets its starch from the cassava and the arrowroot extracted in the most primitive fashion.

Among ornamental trees and plants the cabbage palm (*Oreodoxa oleracea*), lifting its feather-like crown to majestic heights, easily wins first place in the admiration of all beholders. The heart of this tree—that is, the bud or young unfolded leaves—is very highly prized as a dish, tasting very much like the ordinary cabbage. But, owing to the great waste for such a small gain, there is a sentiment against cutting the tree. The cocoanut tree is also quite generally used as an ornamental tree, particularly along the highways and as a line of demarkation between the estates, so that they often present a striking and picturesque appearance. In fact, the palm avenues of St. Kitts are much admired by visitors. Another very interesting palm is that known as the traveller's palm. The leaves of this branch out fan-like, and from their base, when pierced, a quantity of water flows; from which fact the tree gets its name.

Much more might be said about the fruit and ornamental trees of this island. Then, too, there are the marvellous ferns, about which many things might be said; but, after all is said, a true conception of the bewildering and exquisite beauty of a St. Kitts fernery is impossible.

It ought to be said that the following list is not offered as absolutely complete, but it is confidently believed to contain all the important plants. The greatest number of omissions is believed to be in the timber of the mountains, as it was not practicable to get a complete list of specimens for classification.

Then, again, as botanists do not all agree, there may arise in the minds of some a doubt as to the correctness of certain classifications, but it is claimed that that given below rests on good authority. Of course, mistakes are not only possible but very probable in work of this kind.

The vernacular names given in the list are such as one actually hears in the island, and may often differ from those in use in other of the British West Indies, or in botanical or other books.

The uses specified are the ones to which the plants are applied in St. Christopher, although they may be applied to other and more important uses in other places. In the case of the medicinal plants, only those that are recognized in some pharmacopœia or in commerce

are included in this list, as it would otherwise assume very large proportions. The people attach importance to a great number of plants for their medicinal properties.

The writer wishes to acknowledge, with due appreciation, the kind, generous, and invaluable services of Dr. W. J. Branch, of this island, in the preparation of this article. Dr. Branch has lived long on the island, and has not failed to use his eyes and learning in all matters pertaining to St. Kitts.

The numbers prefixed to certain of the plants refer to the notes at the end of the list.

LIST OF THE PRINCIPAL ECONOMIC PLANTS, INDIGENOUS OR INTRODUCED, THAT ARE NOW, JANUARY, 1901, IN ST. CHRISTOPHER, WEST INDIES.

CLASS I.—DICOTYLEDONS.

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Anonaceæ—	Anona muricata	Sour Sop	Fruit
	Anona squamosa	Sugar Apple	Fruit
	Anona reticulata	Custard Apple	Fruit
	Anona cherimolia	Cherimoyer	Fruit
Menispermaceæ	Cissampelos Pareira	Velvet Leaf	Medicine
Nymphæaceæ—	Nymphæa alba	Water Lily	Flower
Cruciferæ—	Nasturtium officinale	Water Cress	Food
	Cochlearia armoracia	Horse Radish	Food
	Brassica oleracea	Cabbage	Food
	Brassica rapa	Turnip	Food
	Sinapis nigra	Mustard	Food
	Sinapis alba	Mustard	Food
	Raphanus sativus	Radish	Food
(1)	Cleome pentaphylla	Missambi	Food
	Moringa pterygosperma	Horse Radish Tree	Food
Violaceæ—	Viola odorata	Violet	Flower
	Viola tricolor	Pansy	Flower
Canellaceæ—	Canella alba	Canella	Medicine
Bixineæ—	Bixa Orellana	Roucou	Food and Dye
	Flacourtia Ramontchi	Governor Plum	Fruit
Caryophylleæ—	Dianthus Caryophyllus	Carnation (2)	Flower
Guttiferæ—	Mammea americana	Mammy Apple	Fruit
Malvaceæ—	Hibiscus phœniceus	Dwarf Hibiscus	Flower
	Hibiscus mutabilis	Changeable Hibiscus	Flower
	Hibiscus mutabilis var. flore pleno	Double Changeable Hibiscus	Flower
	Hibiscus schizopetalus	Tassel Hibiscus	Flower
(3)	Hibiscus Rosa-Sinensis	Large Red Hibiscus	Flower
	Hibiscus Sabdariffa	Sorrel	Food
	Althæa rosea	Hollyhock	Flower
	Abelmoschus esculentus	Ochroe	Food
	Abelmoschus moschatus	Musk Ochroe	Perfume
	Gossypium herbaceum	Cotton	Fibre
Bombacineæ—	Eriodendron anfractuosum	Silk Cotton	Ornamental Tree
	Carolinea princeps	Carolinea	Ornamental Tree

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Sterculiaceæ—	Theobroma Cacao	Chocolate	Food
	Cola acuminata	Cola	Food
Tiliaceæ—	Sloanaea jamaicensis	Break Axe	Timber
	Triumfetta rhomboidea	Mahat (Mahae)	Fibre
Rhamneæ—	Colubrina ferruginosa	Iron Wood	Timber
	Colubrina reclinata	Mawbee	Food
	Zizyphus Jujuba	Dunk	Fruit
Erythroxyleæ—	Erythroxylon coca	Erythroxylon	Medicine
Oxalideæ—	Oxalis acetosella	Wood Sorrel	Flower
Malpighiaceæ—	Malpighia punicifolia	Cerise	Fruit
	Galphimia glauca	Galphimia	Flower
Zygophylleæ—	Guaiacum officinale	Lignum Vitæ	Medicine & Timber
Geraniaceæ	Geranium sanguineum	Scarlet Geranium	Flower
	Pelargonium graveolens	Otto of Rose Geranium	Perfume
Balsamineæ—	Impatiens noli-me-tangere	Balsam	Flower
	Impatiens sultani	Sultana Balsam	Flower
Tropeoleæ—	Tropæolum majus	Nasturtium	Flower
Rutaceæ—	Quassia amara	Quassia	Medicine & Flower
	Picræna excelsa	Bitter Ash (Simaruba)	Medicine
	Xanthoxylum clava Herculis	Yellow Harklis	Timber
Aurantiaceæ—	Murraya exotica	Citronella	Flower
	Triphasia trifoliata	Myrtle Lime	Fruit
	Citrus Limonum	Lemon	Fruit
	Citrus bigaradia	Bitter Orange	Fruit
	Citrus decumana	Shaddock	Fruit
	Citrus Pompelmous decumanus	Pumple Nose	Fruit
	Citrus Pompelmous racemosus	Grape Fruit	Fruit
	Citrus nobilis var. minor	Tangierine	Fruit
	Citrus aurantium	Sweet Orange	Fruit
(4)	Citrus aurantium var. spinosissima	Lime	
Burseraceæ—	Bursera gummifera	Budge Gum	Gum & Timber
Meliaceæ—	Melia sempervirens	Lelock	Flower & Timber
	Swietenia mahagoni	Mahogany	Timber
	Cedrela odorata	West Indian Cedar	Timber
Ampelideæ—	Vitis vinifera	Grape	Fruit
Sapindaceæ—	Melicocca bijuga	Chenip	Fruit
	Blighia sapida	Akee	Food
Terebinthaceæ—	Anacardium occidentale	Cherry (Cashew) (5)	Fruit
(6)	Mangifera indica	Mango	Fruit
	Spondias dulcis	Golden Apple	Fruit
	Spondias purpurea	St. Kitts' Plum	Fruit
	Spondias mangifera	Chili Plum	Fruit
	Spondias lutea	Hog Plum	Fruit
Leguminosæ—	Indigofera anil	Indigo	Dye
	Indigofera tinctoria	Indigo	Dye
	Sesbania ægyptiaca	Sesbania	Flower & Fibre
	Agati grandiflora	Æschynomene	Flower
	Agati grandiflora var. alba	White Æschynomene	Flower
	Abrus precatorius	Crab-eye	Medicine & Ornamental Seed
	Cajanus indicus	Pigeon Pea	Food
	Arachis hypogæa	Pinders	Food

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Clitoria ternatea	Blue-bell	Food
	Clitoria ternatea var. flore pleno	Double Blue-bell	Food
	Mucuna pruriens	Cow Itch	Medicine
	Dolichos unguiculatus	Increase Pea	Food
	Dolichos sphærospermus	Black-eye Pea	Food
	Lablab vulgaris	Bonny Vis	Food
	Lablab leucosperma	Moonshine	Food
	Phaseolus perennis	Lima Bean	Food
	Phaseolus vulgaris	Common Bean	Food
	Canavalia gladiata	Canavalla Bean	Food
	Faba vulgaris	French Bean	Food
	Pisum sativum	Green Pea	Food
	Erythrina corallodendrum	Coral Plant	Flower
	Lonchocarpus violaceus	Spanish Ash	Timber
	Andira inermis	Wild Olive	Flower & Timber
	Myrospermum frutescens	Myrospermum	Fruit
	Hæmatoxylon campechianum	Log Wood	Medicine, Dye, Flower & Timber
	Parkinsonia aculeata	Jerusalem Thorn	Flower
	Guillandina bonduc	Nicker	Ornamental Seed
	Guillandina bonducella	Nicker	Ornamental Seed
	Guillandina glabra	Nicker	Ornamental Seed
	Cæsalpinea regia	Flamboyant	Flower
	Cæsalpinea pulcherrima	Barbados Pride	Flower
	Libidibia coriaria	Divi Divi	Tannen
	Cassia fistula	Cassia Fistula	Medicine & Flower
	Cassia obovata	Bly Dog (Senna)	Medicine
	Cassia alata	Roman Candle	Flower
	Tamarindus indicus	Tamarind	Fruit
	Hymenæa courbaril	Locust	Flower
	Bauhinia variegata	Napoleon's Cocked Hat	Flower
	Adenanthera pavonina	Circassian Seed	Ornamental Seed
	Desmanthus virgatus	Mimosa	Ornamental Seed
	Mimosa pudica	Shame Bush	Sensitive Leaf
	Acacia Lebbeck	Ladies' Tongue	Timber
	Calliandra Saman	Saman	Ornamental Tree
	Inga laurina	Soldier Wood	Timber
Chrysobalaneæ—	Chrysobalanus Icaco	Fat Pork	Fruit
Rosaceæ—	Rosa rubiginosa	Sweet Briar	Flower
	Rosa lævigata	White Rose	Flower
	Rosa damascena	Damask Rose	Flower
(7)	Rosa semper florens	Ever-bearing Rose	Flower
	Rubus alpinus	St. Kitt's Strawberry	Fruit
Saxifrageæ—	Hydrangea hortensis	Hydrangea	Flower
	Bryophyllum calycinum	Wonder of the World	Flower
	Vereia crenata	Verea	Flower
Rhizophoreæ—	Rhizophora Mangle	Hydrangea	Flower
Combretaceæ—	Quisqualis indica	Quisqualis	Flower
	Terminalia Catappa	West Indian Almond	Fruit
	Combretum laxum	Combretum	Fruit
	Bucida capitata	Yellow Saunders	Timber
Myrtaceæ—	Myrtus communis	Myrtle	Ornamental Plant
	Psidium guayava	Guava	Fruit
	Psidium montanum	Guava	Fruit
	Psidium pyriferum	Spice Guava	Fruit

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Psidium cattleianum	Chinese Guava	Fruit
	Psidium acaule	Guava Berry	Fruit
	Caryophyllus aromaticus	Clove	Food
	Jambosa vulgaris	Pome Rose	Fruit
	Jambosa malaccensis	Malacca Apple	Fruit
(8)	Eugenia acris	Bay Leaf	Perfume
	Eugenia barbadensis	Clove Cherry	Fruit
	Syzygium Jambolanum	Java Plum	Fruit
	Eucalyptus globulus	Blue Gum Tree	Medicine
	Eucalyptus obliqua	Gum Tree	Medicine
(9)	Eucalyptus rostrata	Red Gum Tree	Medicine
	Coroupita surinamensis	Canon Ball Tree	Flower & Timber
	Punica granatum	Pomegranate	Fruit
	Punica granatum var. alba	White Pomegranate	Fruit
Lythrariæ—	Lawsonia inermis	Mignonette (Henna)	Flower
	Lawsonia alba	Mignonette	Flower
	Lagerstroemia indica	King of Flowers	Flower
	Lagerstroemia flos reginæ	Queen of Flowers	Flower
Passifloreæ—	Passiflora laurifolia	Belle Apple	Fruit
	Passiflora maliformis	Conch Apple	Fruit
	Passiflora fœtida	Love in a Mist	Fruit
	Passiflora quadrangularis	Granadilla	Fruit
	Tacsonia sanguinea	Scarlet Passion Flower	Flower
	Carica Papaya	Poppoi (Pawpaw)	Fruit
Cucurbitaceæ—	Cucumis melo	Musk Melon	Fruit
	Cucumis sativus	Cucumber	Food
	Cucumis anguria	Gherkin	Food
	Lagenaria vulgaris	Bottle Gourd	Making cups
	Cucurbita maxima	Pumpkin	Food
	Cucurbita pepo	Squash	Food
	Sechium edule	Choko	Food
	Luffa acutangula	Punch Strainer	Making strainers
	Luffa ægyptiaca	Luffa	As a sponge
	Citrullus vulgaris	Water Melon	Fruit
Begoniaceæ—	Begonia gigas	Begonia	Flower
	Begonia nitida	Begonia	Flower
	Begonia hydrocotylifolia	Begonia	Flower
	Begonia Ingrami	Begonia	Flower
	Begonia fragrans	Begonia	Flower
(10)	Begonia hirsuta	Begonia	Flower
Cactaceæ—	Melocactus communis	Turk's Head	Ornamental Plant
	Opuntia ficus indica	Prickly Pear	Dye & Food
	Opuntia Tuna	Prickly Pear	Dye & Food
	Opuntia coccinellifera	Sweet Prickle	Food for Cochineal Insects
	Epiphyllum truncatum	Epiphyllum	Flower
	Pereskia aculeata	Barbados Gooseberry	Fruit
	Cereus triangularis	Green Snake	Fruit
	Cereus flagelliformis	Small Green Snake	Fruit
	Cereus grandiflorus	Large Cereas	Fruit
Umbelliferæ—	Foeniculum vulgare	Fennel	Food
	Anethum graveolens	Dill	Medicine
	Petroselinum sativum	Parsley	Food
	Apium graveolens	Celery	Food
	Daucus Carota	Carrot	Food
Araliaceæ—	Aralia Guilfoylei	Aralia	Ornament

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Panax filicifolium	Angelica (Seng)	Ornament
	Panax victoriæ	Angelica (Seng)	Ornament
	Hedera Helix	English Ivy	Ornament
Caprifoliaceæ—	Lonicera flava	Honeysuckle	Flower
	Sambucus nigra	Elder	Flower
Rubiaceæ—	Rondeletia speciosa	Rondeletia	Flower
	Mussaenda flaveola	Mussaenda	Flower
	Ixora coccinea	Red Ixora	Flower
	Gardenia floribunda	Cape Jessamine	Flower
	Gardenia floribunda var. flore pleno	Double Cape Jessamine	Flower
	Coffea arabica	Coffee	Food
	Coffea liberica	Liberian Coffee	Food
	Coffea stenophylla	Blue Mt. Coffee	Food
Compositæ—	Zinnia elegans	Zinnia	Flower
	Bidens Coreopsidis	Coreopsis	Flower
	Chrysanthemum sinense	Chrysanthemum	Flower
	Lactuca sativa	Lettuce	Flower
	Aster chinensis	Michaelmas Daisy	Flower
	Solidago virgaurea	Golden Rod	Flower
	Dahlia variabilis	Dahlia	Flower
	Guillardia bicolor	Guillardia	Flower
	Helianthus annuus	Sunflower	Flower
	Calendula officinalis	Marigold	Flower
	Tagetes patula	French Marigold	Flower
	Tanacetum vulgare	Tansy	Medicine
	Artemisia Absinthium	Wormwood	Flower
Ericaceæ—	Pernettya mucronata	Pernettya	Ornamental Plant
Plumbagineæ—	Plumbago capensis	Plumbago	Flower
	Plumbago rosea	Red Plumbago	Flower
Myrsineæ—	Ardisia coriacea	Ardisia	Ornamental Plant and Flower
Sapotaceæ—	Chrysophyllum Cainito	Star Apple	Fruit
	Sapota Achras	Sapodilla	Fruit
	Bumelia retusa	Ballata	Fruit
Jasmineæ—	Jasminum officinale	Jessamine	Fruit
Oleaceæ—	Olea europæa	Olive	Fruit
Apocynaceæ—	Tabernæmontana jasminoides	Tabernemontana	Flower
	Tabernæmontana cristata	Ladies Smock	Flower
	Dipladenia Harrisii	Dipladenia	Flower
	Vinca rosea	Pink Periwinkle	Flower
	Vinca rosea var. alba	White Periwinkle	Flower
	Vinca rosea var. ocellata	Red Eyed Periwinkle	Flower
	Nerium Oleander	South Sea Rose	Flower
	Nerium odorum	Blush Oleander	Flower
	Nerium odorum var. alba	White Oleander	Flower
	Alstonia venenosa	Alstonia	Flower
	Allamanda cathartica	Allamanda	Flower
	Allamanda Hendersoni	Big Allamanda	Flower
	Cryptostegia grandiflora	West Indian Rubber	Flower
(11)	Roupellia grata	Cream Fruit	Flower
	Plumeria rubra	Red Franchipah	Flower
	Plumeria alba	White Franchipah	Flower
Asclepiadeæ—	Stephanotis floribunda	Stephanotis	Flower
	Hoya carnosa	Wax Plant	Flower
Polemoniaceæ—	Phlox Drummondii	Phlox	Flower
Convolvulaceæ—	Pharbitis Learii	Purple Convolvulus	Flower

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Ipomœa Quamoclit	Creeping Pink	Flower
	Ipomœa Quamoclit var. alba	White Creeping Pink	Flower
	Ipomœa bona-nox	Moon Flower	Flower
	Ipomœa Horsfalliae	Horsfallia	Flower
	Ipomœa Nil	Morning Glory	Flower
(12)	Ipomœa batatas	Sweet Potato	Food
	Ipomœa dissecta	Noyau Vine	Perfume in liqueur
Boragineæ—	Myosotis arvensis	Forget-me-not	Flower
	Heliotropium europæum	Heliotrope	Flower
	Cordia Sebestena	The Red Cordia Tree	Flower
	Cordia Sebestena var. lutea	Yellow Cordia Tree	Flower
	Cordia Sebestena var. fulvo-aurea	Orange Cordia Tree	Flower
	Cordia nitida	White Clammy Cherry	Flower
	Cordia Collococca	Clammy Cherry	Food for Poultry
Solanaceæ—	Nicotiana Tabacum	Tobacco	Tobacco
	Datura Stramonium	Night Shade	Medicine
	Datura Tatula	Purple Night Shade	Medicine
	Datura Metel	Night Shade	Medicine
	Brugmansia candida	Angel's Trumpet	Flower
(13)	Lycopersicum esculentum	Tomato	Food
	Petunia nyctaginiflora	Petunia	Flower
	Cestrum nocturnum	Lady of the Night	Flower
	Capsicum frutescens	Nigger Pepper	Food
	Capsicum baccatum	Bird Pepper	Food
	Capsicum annuum var. longum	Lady Finger Pepper Chili	Food
(14)	Capsicum angulosum	Barbados Bonny Pepper	Food
Scrophularineæ	Browallia elata	Browallia	Flower
	Brunfelsia americana	Rain Plant	Flower
	Antirrhinum majus	Snap Dragon	Flower
	Angelonia salicariæfolia	Purple Angelonia	Flower
	Angelonia salicariæfolia var. alba	White Angelonia	Flower
	Russelia juncea	West Indian Heath	Flower
	Maurandia Barclayana	Maurandia	Flower
Utricularieæ—	Utricularia montana	Utricularia	Flower
Gesneraceæ—	Gloxinia speciosa	Gloxinia	Flower
	Tydæa amabilis	Tydea	Flower
	Tydæa picta	Tydea	Flower
	Besleria americana	Besleria	Flower
Bignoniaceæ—	Bignonia reptans	Barbados Queen of Flowers	Flower
	Tecoma stans	Trumpet Flower	Flower
	Tecoma capensis	West Indian Honeysuckle	Flower
	Tecoma leucoxylon	White Cedar	Ornamental Tree
	Crescentia Cujete	Cup Tree (Calabash)	Cups and Timber
Acanthaceæ—	Thunbergia grandiflora	Thunbergia	Flower
	Thunbergia alata	Thunbergia	Flower
	Meyenia erecta	Purple Meyenia	Flower
	Meyenia erecta var. alba	White Meyenia	Flower
	Sanchezia nobilis	Sanchesia	Flower
	Graptophyllum hortense	Graptophyllum	Ornament
	Graptophyllum hortense var. carneum	Graptophyllum	Ornament

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Graptophyllum hortense var. bicolor	Graptophyllum	Ornament
	Eranthemum nervosum	Blue Eranthemum	Flower
	Eranthemum bicolor	Eranthemum	Flower
	Eranthemum nigrum	Eranthemum	Flower
	Eranthemum purpureum	Eranthemum	Flower
	Fittonia argyroneura	Fittonia	Flower
Pedalineæ—	Martynia diandra	Cock's Spur	Flower
Verbenaceæ—	Verbena Lamberti	Verbena	Flower
	Citharexylum cinereum	Fiddle Wood	Flower
	Duranta Plumieri	West India Laburnum	Flower
	Duranta Plumieri var. alba	White Laburnum	Flower
	Petrea volubilis	Petrea	Flower
	Clerodendron fallax	Clerodendron	Flower
	Clerodendron Thomsonæ	Clerodendron	Flower
	Clerodendron Balfouri	Clerodendron	Flower
Labiatæ—	Ocimum basilicum	Basil	Food
	Salvia splendens	Salvia	Flower
	Salvia lætea	White Salvia	Flower
	Lavandula stœchas	Lavender	Perfume
	Rosmarinus officinalis	Rosemary	Perfume
	Mentha piperata	Peppermint	Medicine
	Origanum majorana	Sweet Marjoram	Medicine
	Pogostemon sp. (?)	Patchouly	Perfume
Nyctagineæ—	Mirabilis dichotoma	Four o'clock	Flower
	Bougainvillæa spectabilis	Bougainvillea	Flower
Polygonaceæ—	Antigonon leptopus	Pink Corallita	Flower
	Antigonon leptopus var. flore pleno	Double Corallita	Flower
	Coccoloba uvifera	Seaside Grape	Fruit
Amarantaceæ—	Gomphrena globosa	Bachelor Button	Flower
	Gomphrena globosa	White Bachelor Button	Flower
	Celosia cristata	Cock's Comb	Flower
	Celosia argentea	White Cock's Comb	Flower
	Amaranthus pyramidalis	Prince of Wales Feather	Flower
	Alternanthera mutabilis	Border Plant	Ornament
	Iresine Erbstii	Box	Ornament
Chenopodiaceæ—	Beta Rapa	Beet	Food
	Basella alba	Indian Spinach	Food
Myristiceæ—	Myristica moschata	Nutmeg	Food and Medicine
Laurineæ— (15)	Persea gratissima	Avocado Pear (15)	Fruit
	Oreodaphne coriacea	Loblolly	Timber
	Camphora officinarum	Camphor	Medicine
Moreæ—	Morus nigra	Mulberry	Fruit
	Ficus carica	Fig	Fruit
	Ficus nitida	Barbadoes Evergreen	Ornamental Plant
	Ficus laurifolia	Bearded Fig	Ornamental Plant
	Ficus elastica	India Rubber Tree	Rubber
	Artocarpus incisa var. apyrena	Bread Fruit	Fruit
	Artocarpus incisa var. nucifera	Bread Nut	Fruit
	Maclura tinctoria	Fustic	Dye, Timber & Fruit
	Pilea muscosa	Lace Plant	Ornamental Plant
Casuarineæ—	Casuarina equisetifolia	Casuarina	Timber
Euphorbiaceæ—	Phyllanthus nivosus	Snow Plant	Ornamental Plant
	Croton Eluteria	Cascarilla	Medicine

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
(16)	Croton variegatus	Croton	Ornamental Plant
	Hura crepitans	Sand Box	Ornamental Plant
	Hippomane mancinella	Manchineel	Timber
	Ricinus communis	Castor Nut	Medicine
	Ricinus viridis	Castor Nut	Medicine
	Poinsettia pulcherrima	Devil's Handkerchief	Ornamental Plant
	Acalypha tricolor	Acalypha	Ornamental Plant
	Acalypha marginata	Acalypha	Ornamental Plant
	Euphorbia splendens	Crown of Thorns	Flower
	Manihot utilissima	Cassava	Food
Aristo-	Manihot Aipi	Roasting Cassava	Food
lochiaceæ—	Aristolochia gigas	Giant Aristolochia Plant	Flower
	Aristolochia trilobata	St. Kitts Pitcher	Flower
	Aristolochia elegans	Aristolochia	Flower
Piperaceæ—	Piper nigrum	Black Pepper	Food
Coniferæ—	Thuya occidentalis	Arbor vitæ	Ornamental Plant
	Araucaria excelsa	Norfolk Island Pine	Ornamental Tree
	Araucaria imbricàta	Monkey Puzzle	Ornamental Tree
Cycadaceæ—	Cycas revoluta	Sago	Ornamental Plant

CLASS II.—MONOCOTYLEDONS.

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Cannaceæ—	Maranta arundinacea	Indian Arrow	Food
	Canna tous-les-mois	Tous-les-mois	Food
	Canna coccinea	Plantain Shot	Flower
	Canna lutea	Yellow Plantain Shot	Flower
	Canna speciosa	Canna	Flower
Zingiberaceæ—	Costus afer	African Lily	Flower
	Zingiber officinale	Ginger	Medicine
	Curcuma longa	Dye Ginger (Turmeric)	Food
	Alpinia nutans	Shell Plant	Flower
Musaceæ—	Heliconia Bihai	Wild Plantain	Flower
	Heliconia psittacorum	Yellow Wild Plantain	Flower
	Musa sapientum	Fig (Banana)	Food
	Musa chinensis	Dwarf Banana	Food
	Musa paradisiaca	Plantain	Food
Bromeliaceæ—	Ananassa sativa	Pine Apple	Fruit
	Æchmea fulgens	Æchmea	Flower
	Pitcairnia bromeliæfolia	Pitcairnia	Flower
Orchideæ—	Dendrobium Pierardi	Dendrobium	Flower
	Dendrobium druidum	Dendrobium	Flower
	Dendrobium moschatum	Dendrobium	Flower
	Dendrobium spectabile	Dendrobium	Flower
	Epidendrum ciliare	Rock Lily	Flower
	Epidendrum nutans	Epidendrum	Flower
	Epidendrum cochleatum	Epidendrum	Flower
	Epidendrum fragrans	Sweet Epidendrum	Flower
	Cattleya Mossiæ	Cattleya	Flower
	Phaius grandifolius	Ground Orchid	Flower
	Vanda teres	Vanda	Flower
	Aërides affine	Ærides	Flower
	Stanhopea grandiflora	Ladies' Slipper	Flower

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Oncidium papilio	Butterfly Orchid	Flower
	Oncidium luridum	Oncidium	Flower
	Oncidium montanum	Yellow Bee	Flower
	Oncidium Lanceanum	Cedros Bee	Flower
	Oncidium sp. (?)	Crater Lily	Flower
	Oncidium ampliatum	Big Yellow Bee	Flower
	Oncidium altissimum	Oncidium	Flower
	Brassia maculata	Brassia	Flower
	Ionopsis maculata	Ionopsis	Flower
	Vanilla planifolia	Vanilla	Flower
Irideæ—	Gladiolus communis	Gladiolus	Flower
Amaryllideæ—	Crinum australe	Tiger Lily	Flower
	Pancratium caribeum	White Lily	Flower
	Pancratium guianense	Curly Lily	Flower
	Eucharis amazonica	Eucharist Lily	Flower
	Amaryllis equestris	Red Lily	Flower
	Amaryllis tubispatha	Snow Drop	Flower
	Apiastrum Solandrifolium	Solander's Lily	Flower
Liliaceæ—	Lilium Harrisii	Water Lily	Flower
	Polianthes tuberosa	Tube Rose	Flower
	Polianthes tuberosa var. flore pleno	Double Tube Rose	Flower
	Yucca gloriosa	Yucca	Flower
	Agave americana	Corretah	Flower and Ornamental Plant
	Fourcroya cubensis	Sisal	Fibre
	Sansevieria zeylanica	Sansisvera	Fibre
	Aloe barbadensis	Aloes	Medicine
	Allium porrum	Leek	Food
	Allium sativum	Garlic	Food
	Allium ascalonicum	Shallot	Food
	Allium scorodoprasum	Rocky Bolt	Food
	Allium schœnoprasum	Chives	Food
	Allium cepa	Onion	Food
	Asparagus officinalis	Asparagus	Food
	Asparagus plumosus	Plumosus	Ornamental Plant
	Dracæna draco	Dragon's Blood	Ornamental Plant
	Dracæna australis	Green Dracæna	Ornamental Plant
	Dracæna fragrans	Sweet Dracæna	Flower
	Dracæna terminalis	Pink Dracæna	Ornamental Plant
Dioscoreaceæ—	Dioscorea alata	Red Yam	Food
	Dioscorea sativa	White Yam	Food
Hypoxideæ—	Curculigo sumatrana	Curculigo	Ornamental Plant
Palmæ—	Areca alba	Areca Palm	Ornamental
	Areca rubra	Areca Palm	Ornamental
	Hyophorbe verschaffelti	Hyophorbe Palm	Ornamental
	Oreodoxa oleracea	Cabbage Palm	Ornamental
	Caryota saccharifera	Sugar Palm	Ornamental
	Caryota urens	Maiden Hair Palm	Ornamental
	Corypha Taliera	Talipot Palm	Ornamental
	Euterpe montana	Mountain Cabbage	Food
	Dypsis madagascariensis	Dypsis	Ornamental Plant
	Thrinax argentea	Thatch Palm	Ornamental Tree
	Thrinax radiata	Thatch Palm	Ornamental Tree
	Rhapis flabelliformis	Cane Palm	Ornamental Plant
	Livistona chinensis	Chinese Fan Palm	Ornamental Tree

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
	Phoenix dactylifera	Date	Food
	Cocos nucifera	Cocoanut	Food
	Acrocomia sclerocarpa	Mocko Palm	Ornamental Seed
	Stevensonia grandifolia	Golden Palm	Ornamental Tree
Pandaneæ—	Pandanus utilissimus	Screw Pine	Ornamental Tree
	Pandanus Beechii	Pandanus	Ornamental Tree
Cyclanthaceæ—	Carludovica Plumieri	St. Kitts Sarsaparilla	Ornamental Twiner
Aroideæ—	Monstera pertusa	Button Hole Bush	Ornamental Twiner
	Monstera deliciosa	Monstera	Fruit
	Anthurium macrophyllum	Wild Tobacco	Ornamental Plant
	Xanthosoma sagittifolium	Xanthosoma	Ornamental Plant
	Dieffenbachia seguine	Dumb Cane	Ornamental Plant
	Dieffenbachia maculata	Dieffenbachia	Ornamental Plant
	Colocasia esculenta	Scratchy Eddoes	Food
	Colocasia sagittifolium	Tanier	Food
	Arum macrorrhizum	Roasting Eddoes	Food
	Alocasia bicolor	Allocasia	Ornamental Plant
	Alocasia metallica	Allocasia	Ornamental Plant
	Alocasia macrorrhiza	Seven Years	Food
	Caladium sagittæfolium	Colalue	Food
	Caladium maculatum	Caladium	Ornamental Plant
Smilaceæ—	Smilax officinalis	Sarsaparilla	Medicine
Pontederiaceæ–	Eichhornia azurea	Water Lily	Flower
Commelinaceæ–	Campelia zanonia	White Campelia	Flower
	Campelia zanonia var. lutea	Cream Campelia	Flower
	Campelia purpurea	Resurrection Lily	Flower
	Commelina zebrina	Striped Commelyna	Flower
	Tradescantia discolor	Oyster Lily	Flower
Cyperaceæ—	Cyperus alternifolius	Cyprus	Ornamental Tree
Gramineæ—	Andropogon schœnanthus	Lemon Grass	Perfume
	Vetiveria arundinacea	Cuscus Grass	Perfume
	Erianthus saccharoides	Wild Cane	Ornamental Grass
	Saccharum officinarum	Sugar Cane	Food
	Sorghum vulgare	Guinea Corn	Food
	Sorghum saccharatum	Chinese Sugar	Food
	Panicum variegatum	Striped Grass	Ornamental Grass
	Panicum jumentorum	Guinea Grass	Fodder
	Paspalum conjugatum	Sour Grass	Fodder
	Zea Mays	Indian Corn	Food
	Coix Lachryma	Job's Tears	Ornamental Seed
	Bambusa arundinacea	Bamboo	Wood and Ornamental Plant.

CLASS III.—ACOTYLEDONS.

NATURAL ORDER.	SCIENTIFIC NAME.	VERNACULAR NAME.	USE.
Filices—	Anemia adiantifolia	Flower Fern	Ornamental Plant
	Lygodium volubile	Vine Fern	Ornamental Plant
	Hymenophyllum sericeum	Bees Wing Fern	Ornamental Plant
	Adiantum cuneatum	West India Maiden Hair	Ornamental Plant
	Adiantum cuneatum var. farleyense	Farleyense Fern	Ornamental Plant
	Pteris argyrata	Silver Snake Fern	Ornamental Plant
	Blechum occidentale	Pink Fern	Ornamental Plant
	Gymnogramma chrysophyllum	Gold Fern	Ornamental Plant
	Asplenium myriophyllum	Parsley Fern	Ornamental Plant
	Nephrolepis exaltata	Herring Bone Fern	Ornamental Plant
	Aspidium macrophyllum	Bread Fruit Fern	Ornamental Plant
	Cyathea arborea	He German Dru (Tree)	Ornamental Plant
	Asophila ferox	She German Dru (Fern)	Ornamental Plant
	Hemitella macrophylla	Gigantic Fern	Ornamental Plant
Lycopodiaceæ—	Selaginella flabellata	Emerald Fern	Ornamental Plant
	Lycopodium cornuum	Stag-Horn Fern	Ornamental Plant

NOTE.—There are about three hundred species of ferns in St. Kitts. Those given have been selected as samples of this sort of plant on account of size or special beauty.

NOTES.

(1) A purple variety of Cleome pentaphylla is also met with here.

(2) There are several varieties of pinks and carnations in the island. When well-known cultivated flowers of many varieties and different colors occur in this list, their variations will not again be specially noted.

(3) There are many hybrids of the genus Hibiscus in St. Kitts, many of which are ranked as separate species by some florists.

(4) Considered by some persons a distinct species and called Citrus Limetta.

(5) There are two varieties; one with red and the other with white fruit.

(6) There are many varieties of mango; some with poor, others with delicious fruit.

(7) Roses abound in St. Kitts. New hybrids are constantly being introduced.

(8) Seems to be a variety of Eugenia buxifolia.

(9) Several species of Eucalyptus have been introduced into the island within the last few years, but only two or three have flowered as yet.

(10) Hybrid begonias, wild and cultivated, abound in St. Kitts.

(11) It flowers very freely but bears no fruit in St. Kitts.

(12) There are many varieties of the sweet potato of very different degrees of merit. The "Mother Kitty" of St. Kitts weighs 12 pounds.

(13) Several sorts are cultivated here.

(14) There are several other varieties of Capsicum in the island.

(15) There are two or three kinds of avocado pears here.

(16) The number of hybrid crotons, already very great, rapidly increases by importation and origination in St. Kitts.

BERMUDA (*alias* SOMERS ISLANDS).

HISTORICAL SKETCH.*

BY

J. MAXWELL GREENE.

The date of the discovery of these Islands by Europeans is somewhat obscure. Juan Bermudez' name has been given to the group on the authority of Oviedo (de la natural Hystoria de los Indios, Toledo, 1576), as follows (Eden's translation):

"In the yeare 1515, when I came first to enforme Your Majestie of the state of things in India, and was the yeare following in Flanders, in the time of your most fortunate successe in these Your Kingdoms of Arragon and Castile, whereas at that voyage I sayled above the Island Bermuda, otherwise called Garza, being the furthest of all the Ilands that are found at this day in the world, and arriveing there at the depth of eight yards of water, and distance from the land as far as the shot of a piece of ordinance, I determined to send some of the ship to land, as well to make search of such things as were there, as also to leave in the Iland certaine hogs for increase. But the time not serving my purpose by reason of contrarie winde, I could bring my ship no nearer the Iland; being twelve leagues in length and six in breadth and about thirtie in circuit, lying in the three and thirtieth degree of the north side. While I remayned here I saw a strife and combat betweene these flying fishes and the fishes called giltheads and the fowles called sea mewes and cormorants, which surely seemed unto me a thing of as great pleasure and solace as could be devised. While the giltheads swam on the brim of the water, and sometimes lifted their shoulders above the same, to raise the flying fishes out of the water to drive them to flight and follow them swimming to the place where they fell, to take and eate them suddenly. Againe, on the other side, the sea mewes and cormorants take many of these flying fishes, so that by this meanes they are neither safe in the Aire nor in the water. In the selfe same perill and danger do men liue in this mortal life, wherein is no certaine securitie, neither in high estate nor in lowe. Which thing surely ought to put us in remembrance of the blessed and safe resting place which God hath prepared for such as love him who shall acquiet and finish the trauailes of this troublesome world, wherein are so many dangers and bring them to that Eternall life where they shall find eternal security and rest."

The terms of this narrative imply a stay of some slight duration, which is to be inferred also from the approximation with the dimensions given. The object of the visit plainly was to leave a herd of hogs. The presence of these animals subsequently in the Islands may be accounted for by the numerous wrecks which occurred before that of Sir George Somers.

* Mainly taken from the *Memorials of the Discovery and Early Settlement of the Bermudas, etc.*, by Maj.-Gen. J. H. Lefroy. 2 vols. London, 1877–79.

In the rare book (three copies only are known to exist in the United States) by Peter Martyr, the *Legatio Babylonica*, published in 1511, a map is given called *La Bermuda*, the genuineness of which is placed beyond a doubt by the text being continued at the back of it.

We are forced, therefore, to conclude that if Juan de Bermudez was the discoverer, as Herrera plainly states, and as the association of his name with the group implies, he must have found them on a previous voyage. He gave no narrative of his own on the subject, and we are indebted to Oviedo for a description.

Herrera says, "They call it the Isle of Bermuda, and by another name, 'Garza,' because the captain who discovered it was called Juan Bermudez." (Historia General, Madrid, 1601; 1st Edi.)

Tradition has it that Bermudez was wrecked on the reefs and that the ship's company were saved, together with many hogs.

The earlier-coined money of the country was stamped with a hog, evidencing a belief that this tradition was founded on fact.

The accounts given of the discovery of the Bermudas must have been favorable, for we learn from Herrera (under date 1527) that Hernando or Ferdinando Camelo, a Portuguese, native of the Azores, learning that the King was desirous of peopling the Island of Bermuda, offered to convey thither, within four years, a goodly number of people, and to raise seeds, flocks, and plants upon certain conditions. The proposal came to nothing, but it has given rise to a local belief that some mutilated initials, with the figures 1543 (which are still to be seen) cut on a rock in Smith's Parish, are a visible proof that Camelo visited the Islands and carved his name there with the date.

Herrera gives in his narrative the details of the contract or agreement.

The treaty provided for the settlement and planting of the Islands, with many conditions and privileges, among which was one to obviate the difficulty of having a settlement solely of Spanish and Portuguese; leave was granted to take in settlers not belonging to these realms. Taxes, including that of Alcavala or taxes on sales of lands, were to be remitted for 20 years, excepting tithes, which for these 20 years were to be divided into five parts; the first for His Majesty, the second for the present or future Bishop or Prelate of the Islands, third for the work of the Church, the two remaining for the said Camelo, to whom the King gave them conditionally for the good-will he showed in establishing the colony, and similarly granted him after the 20 years a tenth part of the tithes

forever. He was given the title of Governor and Captain General of the Islands for life, and that of the son he should appoint conjointly with the person nominated by the King to apportion the lands and houses of the settlement as most expedient according to the quality of the settlers, arranging the same with equity and rectitude, so that no person should be aggrieved thereby.

The above-mentioned advantageous treaty was entered into very readily, for the Island of Bermuda, being 3000 leagues from Castile and 200 leagues from San Juan de Puerto Rico, to the westward, and being uninhabited and being made for by all the fleets and vessels coming from the Indies, it was desirable it should be inhabited, so that there could be found a roadstead and also assistance for so long a voyage, and to ascertain if, with people inhabiting it, a remedy could be found for the tempests there encountered, caused by the great dampness owing to its dense woods; and, notwithstanding the great advantages given, no settlement had been made in the said Island, which, owing to the bad weather there found, sailors had recourse to with great caution.

The Island was called Bermuda or La Garza (the heron) because the captain who discovered it was called Juan Bermudez and his vessel La Garza.

The Islands are mentioned in the Mappa Mundi of Sebastian Cabot, published in 1544 as *Y^a de demonios.* The evil reputation they acquired so early is in itself a proof that they were, in one sense, well known long before their settlement. In the imperfect navigation of those days they served as a landmark for the galleons bound to Spain, which ran through the Florida Channel, following the Gulf Stream as far as latitude 33°, and then steered an easterly course for the Azores. There can be no doubt that many a vessel sighted the Bermudas to her destruction. We have one such instance preserved by Admiral Sir William Monson, who died in 1643, and whose naval tracts were published in 1745, in Churchill's Collection:

> I knew about 50 years since, he says, one Captain *Russel*, a *Frenchman*, shipwrecked on that island. They managed to patch up a boat and so escaped to Newfoundland.

Captain John Smith, in his *General History of Virginia*, 1629, speaks of a visit to Bermuda, and says: "Our men found divers crosses, pieces of Spanish monies here and there," and that the island was overgrown with weeds and plants of several kinds, as "many tall and goodly cedars, infinite store of Palmetoes, numbers of Mulberies, wild olive trees, with divers others unknown both

by name and nature," and also many wrecks. The loss of a French vessel—name not known, commanded by M. de la Barbotière, in 1593—is recounted at length and with great detail by Henry May, an English sailor, who was on board. (See Hakluyt, Vol. IV., 1811, pp. 55–6.)

His narrative is valuable principally to the student of geology as illustrating the gradual subsidence of the Island. He says, "they were cast away on the Northwest part of the Isle of Bermuda and were saved in a boat and a raft," and describes the cliffs as "high," though distant from the land. These "cliffs," as May calls them, or reefs, were then some feet above water, whereas now there are only a few points above water at the lowest spring tide.

Purchas' map, published in 1625, confirms May's statement. It shows that three distinct islets have now disappeared along the line of the northern reefs. The "North Rock," some 14 feet high, and some smaller rocks near it, are all that remain to attest the accuracy of these early descriptions.

In the Record Office in London is preserved the original of Sir George Somers' narrative of his shipwreck, addressed to the Earl of Salisbury, and first published by Major-General Lefroy—

a narrative—he writes—every way worthy of that heroic age when the deeds of Englishmen so far transcended the accounts they left of them.

Sir George says that after having left England bound for Virginia, and when about 200 leagues from the Bermudas,

wee weare taken with a verie greate storme or hurricane which sundred all the fleete & on St. Jame's daye beinge the 23 of Julie (1609) wee had such a leake in our ship insomuch that there was in her 9 ffoote of water before wee knewe of any such thinge we pumped with ii pumpes and bailed in iij or iiij places with certaine Barrackoos & then wee kept 100 men alwaies workinge night and daie from the 23rd vntill the 28th of the same Julie being ffridaie, at which time we saw the Iland Bermuda wheare our ship liethe upon the rocke a quarter of a mile distant from the shoare wheare wee saved all our lives and afterwards saued much of our goodes.

From this date, July 28th, 1609, the party of 140 souls—men and women—remained until the 12th of May following, and during the time two children were born, one—a boy—being named "Bermudas," and the other—a girl—being called "Bermuda." With infinite pains the shipwrecked people succeeded in building two small vessels, and in them they embarked on the 12th May, 1610, arriving off Point Comfort (or Cape Henry) on the 28th of the same month.

There are three other accounts of this expedition, and all agree in praise of the courage and skill of Sir George Somers and of his marvellous endurance. Sir Thomas Gates and Captain Newport,

who were on board the *Sea Vulture*, as the ship was called, are also warmly praised.

The arrival of this company in Virginia was at the time of the famine in that colony. Smith says that Lord De la Ware, hearing of "what plenty there was of hogs and other good things in the Bermudas, was desirous to send thither to supply his necessary occasions." Sir George Somers thereupon volunteered to go for them, and set sail in his cedar ship of about 30 tons upon the 19th of June, and after a long and stormy passage reached his destination. No date is to be found of their arrival.

Sir George Somers, worn out by incessant labour, care, and anxiety, and being past middle age, succumbed, and, after a short illness, "in the very place we now call St. George's town, this noble knight died, whereof the place taketh its name." His men, dismayed at the loss of their leader, disobeyed his last injunctions, and set sail for England, carrying with them their great leader's body, embalmed. This was buried with all hononrs, as befitting his high estate, at Whit Church, Dorsetshire. His heart was buried in what is now the port of St. George's, and over the reputed spot General Sir J. H. Lefroy, Governor of Bermuda in 1876, erected a tablet to commemorate the fact and in testimony to the virtue and bravery of the "heroic Admiral, Sir George Somers."

Out of the ship's company three men remained in charge of the Island, who, having found ambergris (one lump weighing fourscore pounds, with other small pieces), were desirous of returning to Virginia, but were prevented by the arrival of a ship from England, under Captain Matthew Somers, nephew of Sir George Somers, who was of the ship's company with Sir George. This gentleman had persuaded some of the Virginia Company that it might be beneficial to the plantation in Virginia to settle the Bermudas. Accordingly, a charter was obtained from King James 1st (March, 1612), and 120 gentlemen detached themselves from the Virginia Company and formed a company under the name and style of "The Governor and Company of the City of London, for the plantation of the Somers Islands." On the 28th of April, 1612, the first ship was sent out with 50 emigrants under the charge of Richard Moore, who was appointed Governor of the colony. This ship was met by the three men referred to as having been left on the islands, and was safely conducted to anchorage.

Governor George Moore applied himself diligently to the work of fortifying the island. He established his residence at Saint George's, and there built a town. Before the close of 1615 six ves-

sels had arrived, bringing 340 people, among whom was a merchant and one Bartlett, who was sent out to survey and divide the colony into tribes or shares for allotment. This survey, by order of the Governor (whose name seems to have been omitted in the list), was not made. The work was afterwards done by Richard Norwood.

Governor Moore's time having expired in 1615, he returned to England, leaving the colony to be governed by six persons, who were to rule each in turn one month. The first ruler was Charles Caldicot, who sailed for the West Indies to procure plants and cattle. Unfortunately, the vessel was wrecked, and the company were rescued by English pirates from the desert island on which they had been cast away.

The affairs of the little colony now went wrong, through dissension and scarcity of food. Too much time had been occupied in making fortifications, too little in planting, and as a consequence there were few crops grown. The company in England, when this was known, sent out Daniel Tucker as Governor—a stern and determined man and a hard master. He was the first Governor under the Bermuda Company, incorporated in June, 1615, with letters patent from James the First. Governor Tucker, by vigorous measures, compelled the people to work for the Company. He issued rations of food, and paid for labour in a brass coin which bore on one side a hog and on the reverse a ship. (These coins are now become scarce and command a high price.) He also sent to the West Indies for plants and fruit trees, which grew and multiplied. The same vessels which brought them also brought the first slaves —an Indian and a negro.

Governor Tucker's term was marked by harshness, if not cruelty, and during the time there were many attempts made to escape from the colony, some of which were successful. He, fearing recall, returned to England in 1619, leaving one Miles Kendall to act as his deputy. Governor Kendall appeared to be satisfactory to the people; but being a mild, unenergetic man, he was recalled after a few months' tenure of office, and was succeeded by Nathaniel Butler, who arrived with 500 people, thus increasing the number of the population to 1,000. This number was increased by 500 more in the three years of Governor Butler's rule. Under him, in 1620, the first general assembly was held, consisting of the Governor, Council, bailiffs, burgesses, secretary, and clerk. Most of their acts were creditable to the new legislators. It is also interesting to note that the Puritan spirit of opposition to the Established Church was beginning to manifest itself in the colony. To ease their con-

sciences, the Governor himself translated the Guernsey and Jersey liturgies into English, and this, with certain modifications and omissions, seemed to quiet the scruples of those who were beginning to be Nonconformist at heart.

This Governor built the State House and many well-constructed forts and three bridges. Captain John Smith's history, published in 1624, had a map and illustrations of these buildings. It is interesting to note that at this date, 1620, Bermuda had already several buildings and forts of stone, substantial and even handsome, and that the English had only one settlement in North America—that of Jamestown. Plymouth, up to that date, had not been settled, nor Boston, until some ten years later.

The delusion of a belief in witchcraft seems to have developed in Bermuda somewhat earlier than in the other colonies. In the chronicles there are records of trials for witchcraft and of heresy trials of Quakers, who had fled persecution on the Main to encounter it again in the Islands.

The affairs of the little colony were not easy to conduct. The Company in England were dissatisfied that so little profits were realized, and, as the number of colonists increased, opposition to the claims of the Company grew and strengthened, rendering it always a difficult matter for the Governors to keep peace among the people. Religious controversy also added to the general discontent. Nevertheless, the population grew, and, to a certain extent, the people prospered. To their credit it must be said, schools had been established at an early date, with land grants for the maintenance of the teachers.

Negro slaves had been brought in since 1630 and up to 1660 from Africa and the West Indies, and there were also Indian slaves, prisoners of the Pequot and King Philip wars. Stringent laws were in force regarding vagabonds, who were compelled to labour.

During many years there continued a barter trade with vessels from the West Indies for fruits and cedar. This profitable trade was arbitrarily interfered with by the Company, as was also that of whaling—one of the leading industries—to the great detriment of the settlers.

Governor Butler retired in 1622, and for a period of twenty-five years the records are very defective. The Governors were repeatedly changed, and it is chiefly by their attestations to deeds and documents that the order of their succession can be traced.

In 1647 Captain Thomas Turner became Governor, his short term of office being at a most turbulent period. The spread of the

Puritan movement in England had been reflected intensely in the little colony, and religious dissension was rife amongst the people. Governor Turner, instructed by the Home authorities to administer the oath of supremacy and allegiance to His Majesty, proceeded to do so, and was met by stern opposition by a large number of the settlers, who were accordingly imprisoned. In a short time the prison became full—to overflowing—and on the Governor offering to liberate this class of prisoners they refused to leave and had to be forced back to their homes.

The records of this period reveal a most unhappy condition of affairs in the Somers Islands, although their trade and commerce seemed to be all the time prospering.

In 1649 Governor Turner resigned his office owing to the distracted condition of the public, and Mr. John Trimmingham, who had risen in arms against the Independence party, was elected by the people as Governor. His continuance in office was, however, but for a few months, for in 1650 Captain J. Jennings succeeded him, and was in turn—within the year—succeeded by Captain Josias Fforster.

There is reason to believe that in the distractions of the Civil War the plantation was left much to itself, and that some of these changes were brought about by party struggles.

During this stormy period there were many instances of persons being punished for treasonable conduct towards His Majesty.

It seems that the majority of the colonists were loyal to the King, as seen by their letters to the Company and sundry proclamations. At a meeting of all the members of the Council and many colonists, held July, 1649, at a private house, a proposition was made that all the inhabitants be compelled, under full penalty of the law, to take the oath of supremacy and allegiance. Then follows the indignant protest at the *horrid slayinge of the Kinge*. Immediately after a meeting was held of the Governor and Council, at which it was declared

> that wee doe acknowledge the high born Charles, Prince of Wales, to be heir to the crowne . . . after the decease of his royal father, and wee doe hereby declare and utter, we detest and dissent that horrid Act of Slayinge his Majtie, and by the oath wch wee have taken wee shall beare faith and alleadgiance to the Lawfulle Kinge of England, his heirss and successors.

This provoked discussion and dissent among the many who sympathized with the Parliamentary party in England, and many arrests followed, with imprisonments.

It is a singular coincidence that at this time George Washing-

ton, a resident colonist, was prosecuted for treasonable words. He was granted leave of appeal in England, and as his name does not appear again it is probable that he was sent thither.

On March 17th, 1651, the Governor and Deputy of the colony are ordered by the Council of State to cause all letters, declarations, and other papers received by certain ships from Bermuda to be brought to the Council for their perusal, the island having been declared by Parliament to be in rebellion. This order was modified, and letters were permitted, provided they were solely on business transactions. Certain restrictions as to election in the Company were also made at the time.

The people of the colony—or its governing class, the Royalists—did not seem to have comprehended that they were in rebellion to the established power of the Commonwealth. The surrender of Barbados on the 13th Jany., 1652, after a three months' blockade, could not fail to have been known to them and to have influenced their actions, but there is no reference to the subject in the minutes of Council.

That the little body of settlers in Bermuda should have been so misinformed of the magnitude of the force they were opposing as to have thought it possible for a moment to sustain the Royal cause unaided is much more surprising than their prudent submission to the Commonwealth when it became plain that it was established. Accordingly, on February 25th, of the same year (1652), the Governor, Josiah Fforster, and the Council assembled and the general letter sent from the honourable Company, with the orders of Court, were read.

That this act was favorably received, and that the oath of allegiance to the Commonwealth was taken, is most probable, although the chronicles of the time say little or nothing concerning it. The Committee for America reported to the Council of State, October 7th, 1656, upon the state of the Islands in reference to their constitution, governing powers, fortifications, militia, etc., and recommended that the government of the Company be again vested by patent in certain select persons approved by His Highness and the Council of State, and that the government remain at present in the hands of those in power, etc. This report did not interfere with the Company's government to any extent, and apparently no further interference in their affairs was attempted, or if so, no record of the same appears.

The next item of importance is the receipt of a letter signed "in the name and by order of the Council of William Jones, President,"

addressed to Wm. Sayle, Esq., Governor of Bermudas, dated Whitehall, Sept. 4th, 1658, announcing the death on September 3d, 1658, of the Lord Protector, together with a proclamation of the succession of the most noble, illustrious Lord the Lord Richard, eldest son of his said late Highness, etc., etc. Also setting forth the publishing and proclaiming of the said succession, and requesting that the Council and magistrates announce to the people of the colony the said information, according to a form sent for that purpose, which was accordingly done.

This letter was received by Governor Fforster, Governor Sayles not arriving in Bermuda until some time in January, 1659.

The next record of interest is the receiving of an order from the Company dated London, September 3d, 1660, to proclaim the accession to the throne of His Majesty Charles the Second. It reads in part as follows:

> The more especiallie that in Solemne manner His Most Excellent Maiestie, Charles the second, be, throughout the Islands, proclaimed King of England, etc., etc., and
>
> that the oathes of allegiance and Supremacie be taken by You, the Governr and Councell and all Officer, Civill or Military, and all and everie other person or psons within the said Islands, according to Lawe.

Then follow instructions as to setting up the King's Arms, of Assizes, etc.

According to Lefroy, the reign of Charles the Second was characterized in Bermuda, as elsewhere, by a great social deterioration, not only in morals, but in education and public spirit.

From this time on there seems to be little of consequence to note. There is the story of the usual bickerings and strife on secular and religious affairs, but there was a universal dissatisfaction with the rulings and government of the Company that finally resulted in the triumph of the settlers, for on November 27, 1684, upon the proper representation of their grievances, judgment was given against the Company or Charter, and a Colonial Government was established in 1687. Sir Robert Robinson was made the first Governor under the Crown, and was appointed by the Crown.

The former system of government was now changed. The Crown not only appoints the Governor, but also the Colonial Secretary, Chief Justice, Attorney-General, and Receiver-General, who is also the Registrar. The Assistant Judges are appointed by the Governor. The Legislature, over whose sittings the Governor presides, consists of a Council of nine members, and the House of Assembly, the latter elected by the freeholders. There are also

the usual Courts of Justice. This system is based upon the theory of the Government of Great Britain. With certain modifications, the system obtains at this date.

The interval before the establishment of the new form of government for a long period is filled with stirring incidents of fights on the sea to protect the colony from the French and Spaniards, and of the movements of commercial enterprise, and in 1710, the Spaniards again having occupied Turks Island (making prisoners of the people), the Bermudians, at their own expense, sent out a force under Captain Lewis Middleton to regain possession of the Cays. The expedition was successful, but it was found necessary, in order to ensure safety from such attacks, to arm the trading vessels. The Bermudians had always held Turks Island, and had created and maintained a large business in the production of salt. They also successfully undertook the subjugation of the rendezvous of pirates on the Bahamas; five captains and 140 men were captured, and were brought to Bermuda.

It is said that many acts of piracy were perpetrated by the Bermudians. This may be true. In those early days, when the mother country was continually at war, privateering easily and naturally degenerated into piracy. Lefroy relates that Capt. John Wentworth, said to have been an official of the government, being at that notorious haunt of the buccaneers, the Salt Tortuga, in 1665, and having heard that war had broken out between England and Holland, and getting knowledge of the existence of a certain Dutch plantation on Tortola which he thought might be worth plundering, landed accordingly with his crew, made prisoner a planter who called himself Lord of the Island, seized a brigantine, and proclaimed King Charles the Second! When he left the island he carried off 67 negro slaves, whom he took to Bermuda. The Dutchman, who was released at St. Eustatia, made a vigorous remonstrance, and even threatened to invade Bermuda; but the bearer of his hostile missive was put into prison, and the threat was not executed.

The complaint was taken up by the Company in England, and, after much correspondence, the capture was pronounced illegal, the negroes declared to be a royalty, and, by a striking application of the old fable of the oyster, seized for the use of the colony.

From the earliest days the colonists had established schools for their children, but there was little opportunity of obtaining anything like a higher education. Those who could afford it sent their

elder sons abroad for schooling, but the greater part of the youth remained at home with but a rudimentary training.

Doctor Berkeley, Bishop of Cloyne, whose memory is cherished in the United States as a sometime resident in Newport, Rhode Island, and for his literary and philanthropic works, endeavoured to found a college in Bermuda in the year 1725. Unfortunately, the plan was not realized. His college was to supply not only the needs of the colony itself, but also those of the West Indian Islands.

The Rev. Mr. Lyttleton in 1765 again revived the proposed College and Grammar School scheme. His subscription list showed a very handsome amount, and he received assurances of encouragement and support from various islands of the West Indies, but although he had been promised assistance by the Legislature, now that his plan was matured they treated his memorial coldly, and it was ordered in 1773 to lie on the table for consideration.

There is a striking similarity between the cases of Dr. Berkeley and Mr. Lyttleton. Both appear to have been men actuated by the best motives, and both failed, not from any want of exertion on their part, but from a lack of punctuality in those who ought to have furthered their plans in every possible way.

The discontent in the American provinces had at length broken out into open opposition to the Crown, and as the usual supplies from those places were in a great measure cut off, the Bermudians were often much distressed for provisions. Possibly, the almost exclusive cultivation of tobacco, which had always been their principal crop for export, had, in a measure, impoverished the soil, while too little land and time had been given to the cultivation of food crops. At any rate, the people had largely depended for their food supplies on the American colonies.

At this time James Bruere was Governor, and his term, extending from 1764 to 1780, was marked by disorder, financial distress, and almost open rebellion, perhaps not altogether to be charged to misrule, but to the disturbing nature of great events now taking place on the neighbouring continent. Forbidden to trade with their late fellow-subjects, suffering for want of food, distressed by the fact that many of them possessed near relatives and friends engaged in the struggle, matters were, at this period, in a truly deplorable condition with the Bermudians, and everything tended to destroy their good feeling towards the British Government. These circumstances must be considered duly in order to judge fairly of the

following transaction, which has always been regarded as one which had left a stain upon the patriotism and loyalty of the colonists.

General Washington had taken command of the Continental Army at Cambridge, Mass., July 3, 1775, two weeks after the battle of Bunker Hill, and after the affair at Concord. Boston was reduced to a state of siege, and, in short, civil war had broken out with all its horrors.

The General, on taking command, notified the President of Congress, and in his dispatch he stated his great need of ammunition. A few weeks later he wrote to Governor Cooke of Rhode Island, exhorting him to send out two small armed vessels in the province to Bermuda, to bring back a store of powder known to exist there.

The letter was acted upon. Captain Abraham Whipple agreed to engage in the affair, provided that Gen. Washington would give him a certificate under his own hand that, in case the Bermudians would assist in the undertaking, he would recommend to the Continental Congress to permit the exportation of provisions from the colonies to those islands.

General Washington accordingly sent an address to the Bermudians, to be conveyed in these vessels, exhorting them to furnish the needed powder—known to be stored in a secluded place on the Islands—and giving at length the motive that Bermuda, settled by the same people as the more northern colonies, and with just the same aspirations for a greater freedom, should unite with them to make the supreme effort to attain it. The letter of General Washington to Governor Cooke is to be found in "Sparks' Life," Vol. 3, page 47, and the address to the people of Bermuda in the same volume, page 77.

As it turned out, Captain Whipple had hardly set sail before the news came that one hundred barrels of powder had been received at Bermuda by a vessel supposed to be from Philadelphia, and another from South Carolina. The powder had been placed in a remote and secluded cave, and so secure did the authorities consider this place that only occasional visits of inspection were made to it. When Captain Whipple arrived off Bermuda he put in at the west end of the Islands, and the inhabitants were at first alarmed, thinking him to be in command of the King's armed vessel. But when he showed them his commission and instructions they welcomed him with much cordiality and friendship, and informed him that they had assisted in removing the powder. Soon after the inhabitants of Bermuda petitioned the Congress for relief, representing their distress in being deprived of supplies

that came from the northern colonies, and, according to the journal of that body, of Nov. 22, 1775, it was resolved that provisions might be sent them.

The powder sent from Bermuda led to the first great victory gained by Washington in the revolutionary war—the evacuation of Boston, and eventually to the sailing of the army under Gen. Howe to Halifax.

Nothing could exceed the indignation of the Governor when he received intelligence of the plundering of the magazine. Investigations were made, but in vain.

The year 1780 is memorable from the fact that a great hurricane raged then—in the month of October. It is still spoken of as "the great October gale." With the year 1782 began the administration of William Browne.

Governor Browne was a native of Massachusetts, and although an unbending Tory, was held in the highest esteem by his fellow-countrymen, as the following anecdote will show. It is an extract from the proceedings of the Essex Delegates after passing the Boston Port Bill. The 5th resolve, entered into at Ipswich, was "that a committee be raised to wait upon the Hon. Wm. Browne, Esq., of Salem, and acquaint him that with grief this country has viewed his exertions for carrying into execution Acts of Parliament calculated to ruin and enslave his native land; that while the country would continue the respect for several years paid him, it firmly resolved to detach from every further connection all such as shall persist in supporting or in any way countenancing the late arbitrary acts of Parliament, that the Delegates, in the name of the country, request him to secure them from the painful necessity of considering and treating him as an enemy to his country, and therefore that he would resign his office as Counsellor of the late establishment, and decline as a Judge, and in every other capacity, to execute the late Acts of Parliament and all others deemed by the Province as unconstitutional and oppressive."

His reply, sent in writing, proved the high character of the man:

Gentlemen: I cannot consent to defeat His Majesty's intentions and disappoint his expectations, by abandoning a post to which he has been graciously pleased to appoint me—an appointment made without my solicitation or privity, and accepted by me from a sense of duty to the King, with the hope of serving my country. I wish, therefore, to give him no cause to suspect my fidelity, and I assure you I will do nothing without a due regard to their true interests. As a judge, and in every other capacity, I intend to act with honour and integrity and to exert my best abilities, and be assured that neither persuasion can allure me nor shall menaces compel me, to do anything derogatory to the character of a Counsellor of His Majesty's Province of Massachusetts.

WM. BROWNE.

It was with sincere regret that Mr. Browne's compatriots were compelled by the exigencies of war to confiscate his landed estates and to force him from his home and kin. He was a man deservedly beloved and respected, and carried with him into exile the affection of his friends. His appointment to Bermuda was made as a slight return for the great personal sacrifices and for the important services he had rendered on behalf of the crown. The high character of Browne had preceded him in the colony, and he was joyfully received on his arrival. By birth a colonist, he was better able to judge of the wants of the Islands and of the measures necessary to their welfare than persons whose lives had been spent in England.

His first speech to the Legislature was conciliatory, and the impression made by it was never disturbed. Under his wise rule enterprises of many sorts were entered into, and amongst them the whale-fishing (hitherto a monopoly), which was made free to all. The first newspaper in the colony was published in January 1784, and was called the Bermuda Gazette. The Bill providing for the removal of the seat of government from the town of St. George's to a more central situation was introduced in 1787, and was read for the first time. It is pleasing to observe how steadily the colony continued to flourish under the judicious management of Governor Browne. He found the finances of the Islands in an almost hopeless muddle, and left them flourishing.

Governor Browne left for England in October, 1788, and was succeeded by Henry Hamilton as Lieut.-Governor.

The principal commerce of the colony was, at this time, conducted by persons residing at a distance from St. George's, and it was a great inconvenience that the owners of vessels should be compelled to go so far to transact their business. Accordingly, strong efforts were made to induce His Majesty's government to permit the trade of the Islands to be collected in a more central situation. The township contemplated in 1784 was permitted to languish until the Legislature at this period selected the same spot as the place best calculated to suit all parties, and took measures to encourage the building of a town, to which they gave the name of "Hamilton," in compliment to the Governor. After much discussion the plan was accepted, and the town incorporated in June, 1793. Governor Hamilton was relieved October 30th, 1794, by James Crauford.

At this time every encouragement was offered to privateers, the people acted with their usual energy, and by their activity con-

tributed not a little to distressing the enemy in the vicinity of the Islands. Admiral Murray, of the Royal Navy, having recommended to His Majesty's Government the establishment of a dockyard at the Bermudas, the Legislature was summoned October 6, 1795, for the purpose of furthering so desirable an object by such grants or enactments as should be required. The place selected by Capt. Pindar, R.N., was the island now called Ireland Island, on which the establishment was afterwards placed. Several sloops of war were built in the colony in 1796, and the Legislature encouraged seamen to man them by offering bounties.

Governor Crauford was superseded; but not waiting for the arrival of his successor, he resigned October 22, 1796, and the administration devolved on Henry Tucker, President of the Council, who held office until February, 1798, when Governor Geo. Beckwith arrived and assumed the reins.

During Beckwith's term a vote of thanks was proposed and carried in the Assembly to Admiral Murray, not only for recommending the establishment of a naval depot but for the employment of the mechanics of the place in building several ships for His Majesty's service, of the wood of the colony.

Religious dissensions again disturbed the peace of the colony at this time, brought about largely by the incoming of a Methodist missionary, and by his efforts to teach and to preach to the slaves. A bill was passed by the Assembly to prevent persons pretending, or having pretended, to be ministers of the Gospel and not invested with orders according to the rites and ceremonies of the Church of England or that of Scotland from acting as preachers or schoolmasters under certain restrictions. The offending missionary was tried and convicted, fined £50, and sentenced to six months' imprisonment and to discharge all the costs of the Court. The act was disallowed at home, and at the ordinary June Assizes the Grand Jury presented it as a violation of the rights of the subject.

The poet Moore came to Bermuda in 1804 and acted as Registrar of the Court of Admiralty. His residence is pointed out with some pride, and the calabash tree under which he wrote many of his graceful poems is still standing.

The year 1812 is memorable for the beginning of the war between Great Britain and the United States. An American squadron lay ready in New York to strike the first blow immediately after a secret sitting of Congress, and two objects were proposed to the American Council—viz., to seize either the homeward-bound West Indian fleet or the Bermudas. It is said that the first project was

adopted by a casting vote only. Thus the colony had a narrow escape from capture, as it cannot be doubted that the attempt would have been a complete success.

Since the incorporation of the town of Hamilton the inhabitants of the upper and middle parishes had never ceased their efforts to obtain a removal of the seat of government from St. George's, and in 1814 the Home Government consented to the measure.

The removal of the seat of government accordingly took place, and the Assembly met at Hamilton for the first time, January 23, 1815. The clergy of the colony from the earliest times had been not only indifferently remunerated but frequently had great difficulty in collecting the small allowance made them by the Treasury. This had been made frequent matter of complaint by the Governors to the Legislature, and Gov. Cockburn, in opening the session of 1816, pressed the House to place them on a more favorable footing.

During the year 1828 the slave-crews of two vessels belonging to the Bermudas were, on their arrival in Ireland, informed by the authorities that they were free. This declaration was made formally and officially, and yet, notwithstanding this promise of freedom offered to sailors in a distant land, only three boys out of eleven left the ships. The incident speaks strongly in favor of the mild treatment the slaves of Bermuda received from their masters.

No sooner had the intelligence officially reached the colony that the Bill for the Abolition of Slavery had passed the Imperial Parliament (August 1, 1834) than the Legislature was called together, and, in Committee of the whole House, in consideration of the documents submitted to them, resolved "that slavery be abolished in the colony on the first day of August next, and that the apprenticeship system contemplated in said statute be dispensed with so far as regards the colony of Bermuda." This was adopted and passed into a law which was generally approved by the people. The decision, although attended with many cases of individual loss and hardship, was, viewed as a general measure, fortunate for the place, as all the vexations and evils of the apprenticeship system were at once avoided.

Every effort was made to induce the negroes to receive the boon of liberty with discretion. The Governor, Sir S. B. Chapman, issued his proclamation directing the first of August, then approaching, to be religiously observed. Divine service was held in all the churches of the colony; the clergy exerted themselves in public and in private to effect the desired end, and the day passed as decorously as could have been desired. Under the strong and wise

influence of the Rt. Rev. Aubrey C. Spencer, who, as Rector and Archdeacon, had deserved and held the respect and affection of the community, the coloured people had been trained and educated to receive the great blessing of freedom with such good feeling and decorum that few, if any, scenes of disorder occurred.

On the 12th September, 1839, another great hurricane burst on the Islands, causing great damage to property and shipping, although no lives were lost. The following winter was an unusually severe one, and during the night of December 24th, ice, ranging from one-eighth to a quarter of an inch in thickness, formed on the low, swampy lands, and considerable damage was done to vegetation. There appears to have been no record of frost prior to the event or since.

The currency of the colony had hitherto been reckoned at twelve shillings sterling to the pound; but this having been always a source of confusion in business transactions, an act was passed during the session of 1841 to assimilate the currency with that of the mother country. The act came into force after January 1st, 1842. The people of Bermuda suffered about this time through the unsoundness of American institutions, and especially by the failure of the United States Bank. They had also, in 1835, met a loss by the failure of the Fire Insurance Companies of New York—caused by the great fire in that city, which left them so crippled that they were unable to meet the extraordinary claims thus brought upon them.

The terrible earthquake of 1843 was felt, though slightly, in the Bermudas. In the early part of August a dreadful fever made its appearance in St. George's, and spread with great rapidity over the colony.

During all these years the commerce of the colony had been carried on by sailing craft, many of which were built in the islands from the native cedar. Occasional steamers had called for coal or orders, but the need of a permanent, regular steam service had long been felt, and when, in April, 1869, the *Fah-kee* arrived from the United States—the beginning of what was to grow into a permanent and efficient service—there was great rejoicing among the people. The products of the islands are vegetables, almost exclusively, and need careful handling and prompt delivery—conditions difficult to secure in sailing vessels. Several lines of steamers now connect the Islands with the outer world.

The affairs of the colony ran on smoothly for many years under a succession of Governors, who appear to have studied the needs

and best interests of the people. Gen. J. H. Lefroy, whose term, beginning in 1871, continued for some three years, is notable for his great care and vigilance in the exercise of all his duties, and for his compilation of the early annals of Bermuda—a book evidencing great care and study. His works on the flora and fauna and the geology of the group are valuable and trustworthy.

Previous to the Civil War in the United States, Bermuda had for many years only been known to the world as an important British naval station. Its isolation and small extent had kept it from being brought into contact with the outside world to any extent, although occasional cargoes of fresh vegetables were sent to New York, and some few invalids had come and found rest and healing in its balmy air. The Home Government expended vast sums from time to time—in fact, almost continuously—in roads and fortifications; troops were always stationed in the many fortifications, and great works were carried on at the naval station. The great dry dock—the largest in the world—was towed out from England and landed in position on the 28th May, 1869, after a passage of 29 days from the Downs. This dock is sufficiently powerful to lift a ship with a displacement of 10,000 tons—with the weight of the dock, a displacement of 18,000 tons. The larger vessels now being built require a dock still larger, and preparations are rapidly going forward with that purpose in view.

The old town of St. George's had become only a station for calling vessels. Little life was to be seen, except that among the troops quartered at its fortifications. Very occasionally a vessel would come in, then a little movement would be felt, and then repose and quiet would again rule. But the American Civil War awakened the old town into life and activity, for it had become the headquarters of the blockade runners. The wharves and harbour were crowded with steamers, great heaps of cotton and other products were everywhere on its piers and in its warehouses, and money was plentiful. Many fortunes were made at that time, which was one of unprecedented prosperity for the place. With the close of the War, the old town sank back to its normal condition once more, though of late years it has recovered something like commercial activity, for its position is very favourable for passing vessels to enter for coal, water, provisions, etc., and to receive orders from their owners, and this class of commerce is steadily increasing at the present date.

Nowhere in the world does the traveller find more polite and courteous treatment from the native inhabitants—black as well as

white—than in Bermuda. Even the children of the negroes are taught to read and write, the schools being numerous, good, and well attended, as are also the places of worship.

In the largest town, Hamilton, are many fine dwellings, boarding houses, and hotels, which, during the winter season, are filled with people who come to escape the rigours of the northern winter and to enjoy the beautiful climate. This tourist trade is of immense value to the colony.

The Bermudas—alias Somers Islands—are situated in Lat. 32°14′ 5″ North; Long. 64°40′ 55″ West; taken from Gibb's Hill Lighthouse at an altitude of 362 feet above sea-level.

Distances: From St. David's Light to Charleston, S.C., 766 naut. mil.
" " " " " Cape Hatteras, 568 " "
" " " " " Cape Henlopen, 639 " "
" " " " " Sandy Hook, 666 " "

There are about 150 islands and as many more islets, all lying within a space of about 15 miles by 5 miles; the group being in the form of a fish-hook or shepherd's crook, and the longer islands being connected by causeways, bridges, and ferries.

They lie northeastward by southwestward, Ireland Island being at the northwestern end of the crook, St. George's at the other end.

The extreme length of the land is about 26 miles. It varies in width from three miles to three-quarters of a mile. It contains 10,019 acres of land, of which some 2,440 acres are now under cultivation. A larger area for cultivation could be secured by levelling slight elevations, filling swamp lands, and by drainage.

The whole group or archipelago is surrounded by a line of reefs of coral formations, thus making it impossible to enter any harbour at night, or even to find the channel by daylight, without employing a skilled pilot. It is strongly fortified, and, in fact, the group may be considered as a great natural fortress, while it is also the winter headquarters of the North Atlantic and West Indian Squadron, whose summer station is Halifax. It is, in fact, an important outpost of the British Empire.

The visitor, as he approaches the Islands, is struck by their picturesque beauty of outline—the mingling of land and water, as bays, inlets, and little islands, are revealed when the steamer skirts the shore and enters the main bay on her way to the inner harbour—and also by the marvellous colouring in sky and water, which is a never-failing source of delight, not diminished by familiarity.

The transparency of the water and the mildness of the climate

have been noted by many men eminent in the world of science. It has been suggested that a permanent school might be established in the colony for the study of marine growth, with an aquarium and also a botanical station for tropical plants, thus securing to the student immunity from the diseases peculiar to tropical countries, while giving all the advantages of tropical vegetation. Such schools might be established and sustained by the Universities of the English-speaking peoples, to the great advantage of science.

Hamilton is the principal town, and is incorporated as a city, with a population of about 2,000 people. It lies on the southern slope of the inner harbour, and is an attractive place, containing many fine residences and public buildings.

Here are situated the Government Buildings, the principal foreign Consulates, the great hotels and business houses, and it is the depot of all, or nearly all, foreign commerce. Vessels can lie at the wharves with 23 feet of water at low tide. Improvements in deepening the harbour and channels are being considered.

St. George's, the only other town and port, was formerly a commercial centre of importance. Its nearness to the outer sea and its fine harbour make this port convenient for vessels calling for orders, provisions, or coal. A plan for increasing the depth of and widening and straightening the channel has now been submitted for action.

These two ports are the only ones for commercial use. The Government Station at Ireland Island is used exclusively for naval purposes.

The climate of Bermuda is, in the main, soft and gentle. The thermometrical tables furnished by General Russell Hastings, an American resident, extending over a period of 21 years, give but little variation, ranging from 50° in the early morning to 70° at midday during the winter seasons and 85° to 87° in the heat of summer as the maximum temperature. There is neither frost nor malaria. The proximity of the Gulf Stream, running to the westward of the group towards the north and east, serves as a shield, reducing the rigours of the winds that sweep over the ocean from the continent. The condensation of these vapour-laden clouds gives frequent rains, most essential to the land, the porous nature of the same absorbing them so quickly that after even very heavy rainstorms there is scarcely a trace of mud left.

The rain-water is preserved in huge stone tanks or cisterns for household use. There being no springs nor brooks, the wells, containing brackish water, are unfit for use, except for flushing purposes.

The effects of the climate upon the agricultural produce are more favourable than in other countries under the same mean annual temperature. Besides many of the fruits of the temperate regions, the heat of summer permits those of a tropical character to flourish, hence a greater variety may be produced here than in any other part of the world. The season for vegetation is sufficiently extended to ripen a great many kinds of grain, vegetables, and fruit.

The most agreeable season at Bermuda is in the winter or cold season, from November to April or May, the mean temperature being about 60°. Spring begins in February, the weather continuing mild, with refreshing showers and gentle breezes from the south and west, until the end of May. The summer begins in June, but the heats are rarely oppressive until the end of the month, when it becomes sultry. The thermometer rises no more than 87°—rarely higher—but the humidity of the air renders the climate oppressive. In mid-September the weather again becomes pleasant and the atmosphere cooler.

From all this it will be seen that the climate of Bermuda is most healthful to all invalids, excepting those who are suffering from extreme pulmonary troubles.

The buildings, private and public, are made of the native stone—white limestone. This is easily quarried, being cut out by handsaws, but it hardens on exposure. The roofs are covered by thin slates of the same stone, and are then given a covering of cement, after which they are whitewashed, and are quite impervious to water. They are cool, comfortable, and dry, and are of pleasing but simple design, with wide verandas. The general effect is very fine—Spanish or Italian in style, rather than English. The population of the colony is now about 16,113, to which must be added the military strength of some 2,500 men, and the naval contingent.

There is also the army of tourists, who visit Bermuda at all times during the year, but especially from November to May.

The industries are largely agricultural, including an establishment for the manufacture of the home-grown arrowroot, which is said to be the finest in the world. In other agricultural products, also, it stands unrivalled; from 2,440 acres under cultivation the consular records show that the average production was 450,000 dollars annually, sent to the United States. Nor does this include the amount exported to other countries or the amount used in the colony.

With a better system of cultivation, rotation of crops, larger

holdings, more capital invested, and the scientific skill employed that is essential to crop raising as to manufacturing, these figures would show greater and better results. Much idle land—hill-slopes and marshes—that might be filled, would bring up the area that could be profitably cultivated to perhaps more than double the present number of acres; and this is of importance to the people of the United States, for Bermuda furnishes them with fresh vegetables, onions, and potatoes at a time when none are grown there; moreover, these vegetables are of the very best in quality, and come at the most desirable season.

The growing of lily-bulbs—*Lilium longiflorum Harrisii*—to supply the great demand at Easter for floral decorations of churches and houses, is another important industry, needing greater skill and care in its development. These bulbs, in a dormant state, are shipped to America by steamers and sold to the hot-house trade, who plant them under glass, and at the proper time force them, that the flower may be ready at the needed time to meet the great demand at Easter. These flowers, commonly called Easter lilies, seem to be the only lily that can be fully developed at a time when in most demand, and the curtailment of the supply would be matter of great regret to the people of the United States.

NOTES ON THE BERMUDAS.

BY

CHARLES L. BRISTOL.

The Bermudas are a small group of low-lying islands lying alone in the Atlantic Ocean, about seven hundred miles due east from Savannah, Ga., and nearly the same distance south from Halifax, N. S., or in latitude 31° N., longitude 65° W. The present land area comprises five large islands and many small islets. To the north and east of the land is an area of reefs, which, taken with the land, forms an ellipse whose major axis, which runs N. E. and S. W., is about twenty-five miles in length and whose minor axis is about twelve miles.

The whole ellipse, or Greater Bermuda, as Prof. A. E. Verrill, of Yale University, has recently called it, covers about three hundred square miles, and of this the land takes up about twenty square miles, three-fourths of which lies in the main island. The land area is

confined to the southwesterly side of the ellipse, forming a long, narrow strip about thirteen miles long in a straight line, or about twenty miles long following the curve of the ellipse. This strip is seldom two miles wide, and for much of its length is less than a mile wide. On the map it resembles a huge fish-hook, with the shank on the N. E. and the point of the hook on the S. W. There are no harbours available for modern ships on the outer shores of the islands, and there is but one break in the chain of reefs that will admit vessels of any size. This channel, St. George's, at the easterly end of the islands and close to the land, has recently been dredged to admit the largest battleships of the British navy—for Bermuda is one of the three great naval stations of Great Britain along the North American coast.

The principal town and only city is Hamilton, situated near the central part of the group. The approach to this harbour is through the St. George's Channel and along the north shore to the Great Sound lying in the curve of the fish-hook. Thence the vessel proceeds through a narrow channel to her dock. At one point the channel is so narrow that one can easily toss a biscuit to either shore. The city contains about two thousand inhabitants and more than five hundred buildings. It is the seat of the Government and the centre of trade and commerce.

The old capital, St. George's, lies at the extreme northeasterly end of the islands, and dates from the earliest settlements in 1609, and has a population of about one thousand. It is a quaint old place, built as the Spanish towns of the West Indies were built in those days of buccaneers and other hardy men of venture. The streets are narrow and bordered by high walls that make every man's house his castle, but shut off all view save from the second-floor windows.

It has a modest botanical garden that is a gem in its way and worthy of a visit from every tourist. In it, just to the left of the entrance, is a memorial to Sir George Somers, after whom the town is named. At present the business interests of St. George's are dormant. The beautiful and spacious harbour, with ample depth for large steamers, is cut off from the channel by a shallow entrance; but if this obstruction were removed, the old town would probably again waken into its old-time vigour.

The population outside of these two corporations is distributed throughout the islands, which are divided into nine parishes, named: Sandys, Southampton, Warwick, Paget, Pembroke, Devonshire, Smith's, Hamilton, St. George's. The total population is about sixteen thousand, of which about six thousand are whites and ten thousand are coloured. Besides these there are about three thousand one hundred soldiers, sailors, and labourers in the barracks and dockyard.

The whites are nearly all of English descent, a large number of the families carrying their ancestry back to the first or very early comers. The coloured population are descendants of the North American Indians (Pequods largely), who were first used on the plantations as slaves, and of African negroes, who were imported later. They are, as a rule, well built and vigorous, as that word goes in the warm, moist climates.

The industries are entirely agricultural or those pertaining to the catering to the troops and the American tourists who visit Bermuda in large numbers during the winter, though the charm of early summer, when Bermuda is handsomest, is now attracting others. The principal crops are early onions and potatoes for the New York market, lily bulbs, and arrowroot for starch.

The government is almost if not the very last survivor of the form common to the early colonies in America, such as that of Virginia and Massachusetts. It is vested in a Governor and two councils, appointed by the Crown, and a House of Assembly chosen by qualified electors for seven years.

The religion of the great majority of the islanders is that of the Church of England or that of the Wesleyan Methodists. There are a few Roman Catholics, and about as many Presbyterians, who claim allegiance to the Free Church of Scotland.

Public education is very inefficient, judged by the standards in the United States, and is confined to lower grades of instruction. There are a few private schools that prepare for college, and do their work well; but the young Bermudian who can do so goes to Canada or to England to complete his education, or failing this, comes to the United States.

The Bermudas had their origin long, long ago, during some vast convulsion of the ocean-floor, when a stream of molten rock spouted upward through a rift, and cooling rapidly as it rose, formed a steep volcanic cone over 15,000 feet in height that rose nearly to the surface. This was covered in the course of geologic time by the shells of the tiny protozoans that fall like a gentle but constant snowstorm from the surface of the ocean as their builders die, and that form a firm foundation for the future island. At last, when the top came near enough to the surface, the floating embryos of corals, mollusks, lime-secreting worms, and plants lodged on it and began a much more rapid deposit of lime-rock material. When the growing masses rose high enough to come within the grasp of the waves, some of them were broken and ground up until at last dry sand beaches lifted their heads above the water, only to be seized upon by the winds and transported over the area until, aided, perhaps, by some elevation of the sea bottom, the whole mass appeared above the wave.

This process of transporting the beach sands by the winds into dunes is going on to-day, and may be seen at the so-called "sand glacier" in Paget parish. The sand in this "glacier" has been moving northeasterly from the beach for the last forty years or more, until it has engulfed a house in its course and obliterated several fields. Of late its course has been retarded and almost arrested by the growth of oleanders, the beach convolvulus (*Ipomea pes capræ*), and a few other plants. As a result the surface is gradually consolidating owing to the action of the carbon dioxide in the rain-water, and becoming rock. Successive showers, charged to some extent with carbonic acid, dissolve a minute portion of the lime, and, percolating through the mass, re-deposit these portions as a cement to bind other grains together. All kinds of curious stratification are to be found in the rocks over the island, evidently resulting from variations in the direction and force of the wind.

This has been called *Æolian formation* by Nelson in his account of the geology of the Bermudas in 1840; and by Dana, in 1875, *Drift sand-rock.*

Extensive caverns exist all over the islands whose floors are now covered by sea-water. These have been produced by the solvent action of the rain-water on the less firmly cemented underlying sands that have been thus washed out into the sea. In ancient geologic time cavern-making must have proceeded on a vast scale, for now the topography of the surface is extensively modified by the "sinks," as the natives call them, which are the depressions left by the falling in of the roofs of caverns grown too large to support the overlying mass.

There is plenty of evidence that the whole of the ellipse, or Greater Bermuda, was for a long time above water. Cedar stumps are often found by divers out on the reefs, and the shells of land snails (*Helices*) have been found in rock now 45 feet under water. One of these snails resembles closely the living form, and another differs mainly in size. Although this evidence points to a comparatively recent subsidence, little, if any, change has taken place during the last 300 years.

Evidence of this is adduced by Prof. Verrill in a recent paper* from the reverse of the ancient seal of the Bermuda Company, engraved on the border of Norwood's map of Bermuda, published in 1626, showing the wreck of a French vessel in 1593 alongside of North Rock. This sketch of the rocks was probably made by Norwood while engaged on his survey in 1617, and shows the rocks very much as they are now. The photograph accompanying this text shows these rocks as they appear to-day, and was taken by a member of the New York University Biological Expedition in 1898. They are the sole remainder of the great land area of Greater Bermuda, and are now nine miles distant from the nearest land. They are 16 to 20 feet high, and stand on a flat platform, just bare at dead-low water. Near the base each rock is worn so as to show a neck, and as time goes on, and this neck becomes smaller, they must be toppled over during some violent storm.

The reefs of Bermuda are commonly, and quite appropriately, called sea-gardens by the Bermudians. They are easily visited, and the coloured fishermen, who spend almost all their lives upon them, know them as well, if not better, than the landsmen know the land. Their boats are equipped with water-glasses, through which one sees to the bottom through thirty feet of water as through a window.

* Notes on the Geology of the Bermudas, Am. Jour. of Sci., Vol. IX, May, 1900.

NORTH ROCK, BERMUDA.

The coral masses are of various colors—some yellow, some chocolate brown, others almost white. Great sea-rods and sea-fans (*Gorgonias*) wave lazily in the tide, and stand out in boldly contrasting colours of purple or brown from among the masses of green and olive sea-weeds. Here and there are clusters of sponges—some bright scarlet, some vivid green, others dull and inconspicuous. Sea-urchins, deep black, with long spines (*Diadema*), or purple and partly covered with dead shells, sea-weed or other flotsam (*Toxopneustes*), stand out like knobs on the rocks. Great sea-puddings, as a holothurian (*Stichopus*) is called, crowd together at the bottom, while in the crannies and on the sides of the rock is a great host of calcareous weeds, mollusks, lime-secreting, tube-building worms, ascidians, hydroids, and beautiful sea-anemones. To the zoölogist these reefs are of intense interest, for here, only a short run from New York by the Quebec Steamship Company's steamers, in a location absolutely free from fevers, and with a climate mild and delightful, he may study tropical marine fauna with ease and pleasure.

NOTES ON CLIMATOLOGY.

BY

ROBERT De C. WARD.

CLIMATE OF MAMMOTH TANK, CALIFORNIA.—One of the most interesting places in the United States from the point of view of climate is Mammoth Tank, Cal., situated on the line of the Southern Pacific Railroad in the eastern portion of San Diego Co., and in the southern portion of the Colorado Desert. This station has gained a certain amount of distinction because of the statement in Greely's *American Weather*, page 138, that Mammoth Tank, Cal., and Camp Mohave, Ariz., "doubtless have the smallest-known rainfall on the face of the globe." While this is a somewhat misleading statement, yet, nevertheless, Mammoth Tank does possess a peculiar interest because of its very small annual rainfall. In the February number of *Climate and Crops: California Section*, there is an account of the Climatology of Mammoth Tank. From this account it appears that the mean annual temperature, based on records of 23 years, is 76.0°. July is the warmest month, with a mean temperature of 98.5°; and January is the coldest, with a mean of 53.9°. The highest temperature was recorded on August, 17, 1878, and was 130°, and the lowest was 22°, in December, 1895, giving an absolute range of 108°. Temperatures of 100° and over have been recorded in every month except January, February, November and December, and temperatures of 90° and above in every month of the year. Temperatures of 120° and over have occurred in the five months of May, June, July, August and September. The mean annual rainfall for 23 years is 1.81 inches. The greatest amount in any one year fell in 1889, and measured 5.48 inches; while in 1897 and 1898 there was only a trace during the whole year. The greatest monthly rainfall was 3.18 inches in December, 1889. In June the rainfall record for each one of 22 years is marked "0." Only once during the whole period of 23 years was there as much as a *trace* of rainfall during this month.

THE OLD YUMA TRAIL.—A graphic description of the climatic conditions of this same arid portion of our country is given by McGee in a paper on "The Old Yuma Trail," in the *National Geographic Magazine* for March and April last. The pathetic history

of the loss of life along the Trail in the days of the gold fever is written in the numerous graves, which are noted on the route. And yet

> The roll will never be written in full, since most of the unfortunates left no records, scores leaving no sign save bleaching bones; but observers estimated that there were 400 victims of thirst between Altar and Yuma within eight years.

The desert vegetation, the sinks and playas, and a desert storm all come in for a share of the description. The storm, which gave twenty minutes of continuous downpour, yielded a precipitation which was estimated at 1½ to 1⅓ inches, and yet

> Over the waste of drifted sand not a rill was formed, not a puddle was produced, not even a watery surface was seen save in a few "slick spots" (*i. e.*, the alkaline silt patches) of the cowboys—the sand simply swallowed the flood like a sponge, and was visibly moist only to depths of 3 to 4½ inches.

Of peculiar interest are Las Tinajas Altas, a series of pot-holes or cataract pools worn in the bottom of a gulch by the torrents which are produced by the rare storms of that region, and containing water. These high tanks lie on the leeward side of a rugged range of hills, which is the first to intercept the moist current from the Gulf of California. This whole region, unattractive as it may seem at first sight to most persons, has been the scene of a most wonderful struggle and development of animal and plant life, as has been so well described by McGee himself in previous papers. The "unparalleled solidarity" of the life in the desert, as McGee has termed it, was developed because of the common struggle of all forms of life against the hard climatic conditions surrounding them, these conditions forcing animals and plants

> into a harmonious interrelation in which none could dominate without risk of starvation, none yield unduly without certainty of extinction.

CLIMATE OF MANILA.—A recent publication of the Jesuit Observatory of Manila contains a summary of observations of pressure, temperature, and humidity taken hourly during 1883–1898, and of rainfall taken during 1865–1898. From these tables it appears that the normal monthly and annual temperature, relative humidity, and rainfall are as follows:

	TEMPERATURE. (Degrees Fahr.)	RELATIVE HUMIDITY. (Percents.)	RAINFALL. (Inches.)
January	77.0	77.7	1.193
February	77.7	74.1	0.413
March	80.4	71.7	0.736
April	82.9	70.9	1.142
May	83.3	76.9	4.197

	TEMPERATURE. (Degrees Fahr.)	RELATIVE HUMIDITY. (Percents.)	RAINFALL. (Inches.)
June	82.0	81.5	9.622
July	80.8	84.9	14.567
August	80.8	84.4	13.866
September	80.4	85.6	14.925
October	80.4	82.6	7.536
November	79.0	81.6	5.126
December	77.4	80.7	2.134
Year	80.2	79.4	75.457

CLIMATIC DIFFICULTIES IN THE WAY OF THE PROPOSED RAILROAD TO INDIA.—Sir T. H. Holdich, in a recent article on "Railway Connection with India" (*Scottish Geographical Mag.*, May, 1901), points out very clearly some of the engineering and other difficulties which are to be met with along the various proposed routes for a railway to India. Among these difficulties that connected with the climate is given considerable prominence. Thus the region of the Hindu Kush presents vast, if not impossible, engineering problems to be solved, if ever a railroad is put through that region; and, furthermore, the violent storms of wind and snow, the avalanches of stones and mud, and the intense cold of the winter are stated to be beyond the possibility of successful conquest by any conceivable future principle of railway development. Again, the route along the coast from Persia would take the railroad through climatic conditions which for four or five months of the year are regarded as "insufferable," and this climatic objection the writer believes to be almost enough to be prohibitive, so far as this proposed line is concerned.

HINTS TO TRAVELLERS REGARDING METEOROLOGICAL OBSERVATIONS.—An article designed to supply travellers with the necessary instructions in the use of the ordinary meteorological instruments which they may carry with them is contributed by Dr. H. R. Mill to *Hints to Travellers, Scientific and General, edited for the Council of the Royal Geographical Society by John Coles* (8th edition, London, 1901). Dr. Mill has also gone a step further. Many travellers carry no instruments, but wish to make observations of some sort on the climatic conditions of the countries through which they are passing. The needs of this class of persons are met by Dr. Mill in a series of instructions designed to show how evidences of the climates through which the traveller's journey takes him may be

obtained by noticing the effects produced by the climatic conditions upon the land, vegetation, human occupations, and the like. If all travellers were to follow some systematic and intelligent scheme of observations regarding meteorological phenomena we should have fewer vague and unreliable descriptions of the sort which now encumbers books and articles dealing with travel.

THE EFFECT OF THE WEATHER IN GERMANY ON THE AMOUNT OF NITRATE EXPORTED FROM CHILE.—The report of the director of the "Asociación Salitrera de Propaganda" for the year 1900 brings out a striking illustration of the effect of weather conditions in a distant country upon the amount of nitrate exported from Chile in that year (Bulletin Bureau of American Republics, April, 1901, 672). The decrease in the consumption of nitrate in Germany in 1900 amounted to 1,273,050 quintals. The reasons for this falling off are stated to have been connected with the weather conditions. In 1899 the weather in Germany was favourable to the growth of straw, and this resulted in the production of an unusual quantity of farmyard manure, which naturally entered into competition with the nitrate. Furthermore, late spring frosts in Germany also retarded the use of nitrates, and a long drought in the eastern part of the country prevented their use on the grass lands.

MAP NOTICE.

BY

HENRY GANNETT.

The General Land Office has recently issued an edition of its map of the United States for 1900. In general appearance it differs little from former editions, but the scale has been changed slightly; and as the scale is not given, the reader will find it necessary to determine it from the projection lines. Besides the ordinary recent information assembled upon the map, it presents, by bold lines and lettering, the accessions of territory and the route of the Lewis and Clark expedition. These seem scarcely in keeping with the character of the map, which is certainly not historical.

At the foot of the map are added, upon various scales, small maps or diagrams of our recent accessions of territory. Among them appears "Pine Island," evidently intended for Isle of Pines. The addition of this island in this position in an official map, as a possession of the United States, is a bit of unwisdom, as the implication carried with it cannot fail to irritate our Cuban neighbours.

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

PALEOZOIC APPALACHIA.—The Maryland Geological Survey has more nearly solved the problem of the proper field for a State survey than has been done in any other State. Too much credit cannot be given to Prof. Clark for the breadth of view which has characterised his administration of the affairs of the Survey. The reports are written by high-grade specialists; they are well edited and beautifully printed; and they cover not only the standard subjects of stratigraphic and economic geology, but also the physiographic aspect, which most surveys still ignore. Moreover, they are papers of great educational value, because they deal with subjects of general interest written in clear, untechnical language, and therefore capable of being read by intelligent laymen and used by geography teachers. Of the latter class of papers Willis's Paleozoic Appalachia (*Maryland Geological Survey, Special Publication*, Vol. IV, Part I), is an excellent example.

Willis's paper is prefaced by a statement of some fundamental geological processes under the headings: Illustrations of Erosion; Illustrations of Sedimentation; Illustrations of Deformation; and Relations of the Three Processes. This is followed by a statement of the Paleozoic history of Maryland and the adjacent States, applying the principles of geology to an interpretation of the development of the region. The long, complex, and interesting geological history has already been made familiar to geologists by the work of various observers, but it has never been so clearly and delightfully presented as in this paper, which starts with the Paleozoic era, when

> the region comprised a sea and a land. The sea lay west of the land; the land stretched eastward beyond the present extent of the continent. The shore along which the western sea met the land migrated during ages far eastward and again far westward, with many minor oscillations back and forth, and the areas of land and sea shrank and expanded, each in opposition to the other. The land may be called the continent of *Appalachia;* the sea was the mediterranean of North America.

From this time Willis traces the development step by step, showing the complex history of sedimentation, vulcanism, deformation by mountain-folding forces, and denudation down to the present time. One who reads this paper cannot fail to gain a clear view of

the origin and development of the present Appalachian structure. Nor can he but be impressed with the intimate dependence of man upon physiography and of physiography upon geology—a point well stated by Willis in the closing paragraph, as follows:

> The detail of mountain and valley sculptured on the upraised mass is determined by the arrangement of the strata laid down in the vanished Paleozoic sea. The geography, the atmosphere, and the life of that distant time determined initially the plan of the present landscape. They conditioned human existence. Broad farmlands or craggy crests, fertility or sterility, mineral leanness or wealth, the courses of highways and the sites of cities—all the conditions of man's physical environment, are related in the Appalachians to the long Past, even to the remote Past of the era of ancient life.

THE CANADIAN ROCKIES.—Few American geologists have had a more favourable opportunity for the study of broad physiographic features in a large section of almost unknown country than the late Dr. George M. Dawson. Many of his observations and generalisations have been published in various reports, but recently there has appeared a broad summary of the physical history of the Canadian Rockies as his Presidential address before the Geological Society of America (*Bull. Geol. Soc. Amer.*, Vol. 12, 1901, pp. 57–92), unfortunately one of his last utterances upon geology.

On either side—that is, both east and west—of an Archean axis extensive deposits of sediment were accumulated, reaching in the western geosyncline a total depth of over 89,000 feet, in the eastern or Laramide geosyncline over 46,000 feet. All ages, from the Cambrian to the Pliocene, are represented in this great thickness of strata, though it is not probable that the strata were ever actually superimposed at one place or time in the western geosyncline, though no doubt they did attain the full thickness in the eastern geosyncline. During various ages there was extensive extrusion and intrusion of volcanic materials, so that with the sediments there is much igneous rock. Again and again folding occurred parallel to the border of the Pacific basin, causing great changes in the relative level of the land and sea. The force of compression acted from the Pacific side, the greatest recent uplift, and the one from which the present structure has been largely derived, occurring in the period of early Tertiary, as elsewhere in the Rocky Mountains.

This great mass of disturbed rock, with its complex history, has naturally been subjected to tremendous denudation, in part due to its position

> on the eastern border of a great ocean, where, in northern latitudes, an excessive rainfall must have occurred at all periods on the seaward mountain ranges. No com-

parable denuding forces were probably ever operative on the east side of the continent in similar latitudes since the definition of the ocean basins of the Pacific and Atlantic.

Profound subsidence has admitted the sea into the deeply-carved valleys, forming the wonderful fjords along the western coast of Canada.

THE PHYSIOGRAPHY OF ACADIA.—Dr. Daly's paper (*Bulletin of the Museum of Comparative Zoology*, Vol. XXXVIII [Geological Series, Vol. V, No. 3], pp. 73–104, 1901) is a welcome contribution, for it is the first attempt to interpret the physiography of Nova Scotia upon the basis of the modern conception of the subject. It has long been known that the general physiographic development of the Nova Scotia peninsula has resembled that of New England, or, as Daly says, that

as regards axial trends, formational composition, and structure, the uplands and lowlands from Georgia to Gaspé belong to one system.

Mountain-folding of Paleozoic date has introduced very complex geological structure, as in the eastern United States; and the subsidence of the Bay of Fundy region has permitted the accumulation of thick beds of sediment, among which, as in the region to the south, are included the Triassic rocks. These broad points in the geological history of the region are well known; but Daly carries the study further into details, and, as would be expected from one of the Harvard School, especially along the lines of subaërial denudation.

The main object of Dr. Daly's paper is to bring forward evidence that the Acadian land-forms have been twice reduced to the peneplain condition,

each (peneplain) a nearly perfect plain of denudation, interrupted by incised valleys and surmounted by residual hills.

These plains are believed by Dr. Daly to be due to denudation that was essentially subaërial. He discusses the alternative hypothesis of bevelling, but does not find that it applies to this region; nor does marine denudation seem to be competent to explain the facts. The Nova Scotia region, therefore, resembles the New England region in physiographic history, as might be expected. This correspondence in history in the two regions is clearly brought forward in a table of parallel columns—one for Acadia, the other for New England—and the resemblance between the two is striking.

Even one who does not thoroughly agree with Dr. Daly in his interpretation of the facts cannot fail to be impressed with the

great value of the paper as a statement of important fact and a masterful discussion of the subject. It stands as one of the best contributions to the literature of peneplains, now quite extensive; and, like several papers by Prof. Davis, it is distinguished from many others in the fact that it considers the question whether it may not be possible to adopt some other explanation. Whatever may be the fate of the peneplain explanation, it is certain that many so-called peneplains will not stand the test of real investigation; and that if the explanation is established, for a particular region, it will not be upon the basis of affirmation—a means which not a few American geologists are still employing. Rather it will be by such careful discussions as Dr. Daly's paper, the several papers by Profs. Davis, Hayes, and Campbell, and a very few others.

THE PREGLACIAL DRAINAGE OF OHIO.—The interference with the pre-existing drainage by the glacier and its deposits has led to many perplexing problems upon which physiographers have been long at work. The problem is especially perplexing from the fact that critical sections are often completely obscured by drift; but in those States, such as Ohio, where many borings have been made for oil and gas, the problem offers opportunity for solution. The paper before us (*Ohio State Academy of Science, Special Papers:* No. 3, Dec., 1900) contains contributions from four investigators—Messrs. Tight, Bownocker, Todd, and Fowke—whose studies were made possible by the research fund established by the wise generosity of Mr. Emerson McMillin. Each paper deals with a specific region, and is illustrated by a map showing the interpretation which its author places upon the drainage peculiarities of his district. Much of the discussion is of purely local interest, the point of general interest being the very large number of changes in stream-courses resulting from glacial deposits in pre-existing valleys. As a result of these changes the drainage of the State has become different from that of preglacial times, not merely in detail, but in many fundamentally important respects. The most important of these diversions is that previously described by Chamberlain and Leverett, by which the entire upper Ohio, above New Martinsville, was withdrawn from the Erie drainage and added to the Ohio. Could the preglacial drainage of the State be restored there would need to be numerous changes in the industries of the region. For example, numerous towns now located on good-sized streams would find themselves either on divides or else on small tribu-

taries, and cities now connected with the sea by the Ohio and Mississippi would be on small streams tributary to the St. Lawrence system.

OLD CHANNELS OF THE MISSISSIPPI IN SOUTHEASTERN IOWA.— In a recent paper under the above title Leverett (*Annals of Iowa*, April, 1901, Vol. V, pp. 38–51) says:

> One would think that a stream which has been dignified by the title "Father of Waters" would be one that had shown evidence of exceptional stability rather than a bent toward vagrancy. But the Mississippi has been truly a vagrant stream; sometimes it has been forced from its bed by the intrusion of ice in the glacial winter, and sometimes by the accumulations of its own dirt or sediment. It has been shifting not only in the middle portion on the borders of Iowa, but in its lower and upper portions as well. So many have been its wanderings that only a part of them are as yet understood.

After briefly describing the various advances and retreats of the ice, Leverett takes up the question of the old drainage, which is so obscured by deep drift deposits that it is difficult to interpret. Then follows a consideration of the effects of the various advances of the ice upon the Mississippi drainage, closing with a statement of the changes which have occurred since the Iowan stage of advance. During this stage the loess was deposited, apparently in some vital way connected with the great streams of the region. The loess filled the valley on the border of Iowa so that the stream flowed near the level of the top of the present bluffs fully a hundred feet above its present level. An elevation followed, and the streams began to deepen their channels; but they flowed in branching courses, as rivers do on a flood-plain, and at first the water began to cut various channels, one by one abandoned as the more direct valleys, or those which did not encounter rock, gained greater depth. The abandoned channels are still plainly seen.

While the course of the river is in large part in the old valley, in some cases it extends across rock walls, and there rapids are found. There seems little reason to expect further changes in the course; in fact, Leverett rather facetiously concludes his discussion by the following sentence:

> Indeed, in this upper part of the valley the "Father of Waters" seems to have settled down to a steady course, except at flood seasons, when it becomes too full to stay within bounds.

CERTAIN PERSISTENT ERRORS IN GEOGRAPHY.

BY

HENRY GANNETT.

In many of the text-books on geography used in the schools to-day old legends which were taught as truths a generation or more ago still survive, in spite of the fact that they have been discredited by geographers for many years. In consequence, these incorrect ideas are still accepted by the great mass of the people, and it is probable that another generation will pass before the truth will filter down from geographers into the text-books and from the text-books to the people.

An example of the persistence of error is the idea that the presence or absence of forests has an influence upon the amount of rainfall. Some keen observer long ago detected the fact that forested regions enjoyed a heavier rainfall than those not forested, and jumped to the conclusion that rainfall was produced by forests, and, as a corollary, that the removal of forests diminished the rainfall. Looking over the earth he found many treeless, desert, and semi-desert regions, and forthwith instanced them as frightful examples of the result of man's wastefulness in destroying the forests. Prominent among these examples are the shores of the Mediterranean, including the Iberian Peninsula, Italy, northern Africa, and Syria, which are often quoted as favourite illustrations of man's destruction of climate by his destruction of the forests.

In reply to this charge man can certainly plead not guilty. If his accusers had possessed a little more knowledge of the causes of climate and the conditions which modify it they would have seen at once that the geography of this Mediterranean region, the present configuration of the land and water, and the prevailing winds are such as to give it a light rainfall, forests or no forests. Furthermore, a knowledge of physiography would have taught them, in corroboration of the above, that the arid or semi-arid conditions now existing must have existed for many thousands, if not millions, of years, for the mountains, cliffs, and cañons are such as are carved only in arid regions, are not those of a moist climate, and these forms have not been made in a day. The situation is simply that the cart has been placed before the horse. Want of rain prevents the growth of trees; want of trees does not prevent rain.

This position is generally accepted among physical geographers, but the majority of the people still reverse cause and effect.

A persistent, widespread, and well-rooted error is the belief that floods in our rivers are greater and more frequent than formerly, and that this is due to the removal of forests from their drainage areas. Every great flood induces another flood of editorial paragraphs in the newspapers to the effect that man, by clearing away forests, has increased the flood-height of streams, and correspondingly diminished the low-water flow.

It is probable, although it has not been proved, that the clearing of land, by cutting away the forests and undergrowth, does change the regimen of streams, increasing their flood-height and diminishing the flow at low stages. In other words, water probably runs off or evaporates more rapidly from bare ground than from ground which is covered with trees or other forms of vegetation. But where the forests are cut away the land is seldom left bare; it is cultivated or quickly becomes covered with bushes, which hold the water quite as effectively as forests.

The main fact, however, is that the floods in our rivers are no greater or more frequent now than in the past. The Ohio river, for instance, has been gauged continuously for many years, and these gaugings show no appreciable change in regimen, whatever changes may have been made in the forest cover of its basin.

In the school geographies we are taught that the fiords of the coast of Norway, those deep gorges, partly filled by the sea, are proof that the coast has been sinking. How could such cañons be cut, it is asked, unless at the time of their construction they were above sea-level? But to-day, on the coast of Alaska, we see just such cañons in course of construction below sea-level. On this coast are scores of glaciers travelling in gorges which, near their lower ends, are many hundred feet below the level of the sea. The Muir Glacier, where its front meets the sea, is over 800 feet thick, 600 feet of which is below the level of the water, and this, like all other glaciers, is constantly carving its bed deeper. The Norwegian fiords were cut by glaciers, and, probably, while the sea and land were at the same relative levels. The coast of Norway may be sinking, but its fiords are not evidence of it.

Other familiar errors concern climate still more directly. The well-known mild climate of the northwest coast of America is commonly attributed to the balmy influences brought to it by the Japan Current; the Gulf Stream is supposed to have the same influence upon the west coast of Europe; and the cold climate of the east

coast of the United States is attributed to a supposed current from the Arctic Ocean hugging this coast.

That these explanations do not explain will be realized after reflection. Can it be supposed that the Japan Current, however warm it may be when it leaves the tropics, retains any appreciable amount of heat after a journey of 6,000 miles in northern latitudes? As a matter of fact, no trace of this current reaches the shores of North America, its force being entirely lost thousands of miles to the westward. There is nothing left but the merest drift of the surface water before the prevalent west wind.

In the North Atlantic the condition is much the same. The Gulf Stream loses its velocity and disappears as a current long before the British Isles are reached. That the cold climate of the eastern coast of the United States is caused by an Arctic current close inshore is disproved by the fact that there is no such current along this coast.

There is probably no phenomenon connected with the physical life of the earth which has been the subject of greater misconceptions than the currents of the sea. The maps of the school books are covered with lines and arrows, indicating currents in every conceivable direction, every temporary drift of surface water reported by navigators having apparently been recorded as a current.

The system of oceanic currents is very simple: a drift of water towards the Equator, a current along it, flowing westward to the land, there dividing, flowing north and south and dispersing.

This equatorial current has been attributed in the text-books to a variety of causes. The unequal heating of sea-water in different latitudes is a favourite explanation. This, however, could produce currents only by changing the volume of the heated water, and, unfortunately, if the water under the Equator were appreciably expanded by heat, it would cause currents in the opposite direction from those which exist. We should find them flowing away from the Equator instead of toward it.

Another explanation given is the increased evaporation in the tropics, thus lowering the surface of the water and causing an inflow from north and south. Were this of any appreciable magnitude it would undoubtedly cause a drift of water to equatorial regions, but there would be no corresponding outflow, such as the Gulf Stream and Japan Current.

A third cause assigned is the diminution of atmospheric pressure on the sea in the tropics, produced by the heating of the atmosphere and its consequent rarefaction. This amounts to a fraction of an

inch in the barometric column, and is, therefore, a small matter. Undoubtedly, if it had an appreciable effect upon the sea, this effect would take the form of a slight flow of water toward the Equator; but, when equilibrium was thus established, there would be no further flow toward the Equator, nor would there be any flow at all away from it.

Still another cause assigned is the increase in density of the water under the Equator, due to excessive evaporation, thus increasing the saltness of the water. It is difficult to see what effect would thus be produced were it appreciable.

The true cause of the ocean currents is sometimes mentioned in the text-books, but, excepting in two of the most recent ones, is given little or no prominence. The initial cause is the trade-winds. These blowing constantly from the northeast and southeast, induce a drift of the surface water in their directions. These two drifts meeting near the Equator flow along it westwardly, developing into a well-defined equatorial current. In the Atlantic this current, after flowing across the ocean, impinges on Cape St. Roque, Brazil, where it divides. The smaller part turns southward and skirts the coast of South America, fading out near the latitude of Cape Horn. The northern and much the larger part flows through the Caribbean Sea and the Gulf of Mexico, gathering strength and momentum in the narrow passages through which it is forced by the body of water behind it, and enters the Atlantic through the Strait of Florida. Here in the open sea it rapidly widens, shallows, and loses its velocity, and in the middle Atlantic is reduced to a mere drift, gradually turning southward to repeat its long journey.

What takes place in the Atlantic takes place on a much larger scale in the Pacific. Here from all parts of that great ocean within the tropics the surface water is driven to the neighbourhood of the Equator by the trade-winds. Along the Equator it flows for thousands of miles in a great current. On reaching the land it divides, and the southern portion subdivides time after time, and finally is lost among the maze of islands constituting Australasia. The northern part skirts the Japanese islands, gradually turning to the northeast, as it gets under the influence of the prevailing westerly winds, and soon disperses in the great waste of waters of the North Pacific.

These are the great oceanic movements. They are initiated by the winds, and their course is modified by the winds and by the shores. Besides changing the courses of the main currents, the

shores and islands divide the currents, sending off numberless little minor streams of water in various directions.

The land absorbs heat rapidly and as rapidly cools. Water, on the other hand, is heated slowly and holds its heat longer. Moreover, the sea is constantly in motion, its waves, tides, and currents —especially the latter—tending to create a uniform temperature throughout its mass. In consequence of all these conditions the sea has a much more uniform temperature in its different parts, and at different times, than the land. It is warmer in high latitudes and cooler near the Equator; it is warmer in winter and cooler in summer. It follows, further, that the coasts upon which the prevailing wind is from the sea share in this amelioration of climate, while the interior of continents and coasts upon which the prevailing winds are from the land do not share in this amelioration of climate.

Here we have the application of all that has gone before. Upon our northwest coast the prevailing winds are from the west, from the sea, and they bring to the coast the climate of the sea, which is warmer, on an average through the year, than the land, and also much warmer in winter and much cooler in summer. The coast of Europe is under similar conditions, while the east coast of the United States and of northern Asia is under reverse conditions. Here the prevailing winds, still being from the west, come from the land, and they give these coasts a continental or land climate, which is much colder in winter and warmer in summer. As was stated before, the cold climate of the east coast of the United States has been attributed to an Arctic current flowing close inshore. If there were such a current, it could have no effect upon the climate of this coast, since the prevailing winds are from the west, and could not bring the cold of the sea to the land.

There is a widespread notion that, in a mountainous region, all divides between streams must consist of mountain ranges, and in most maps ranges are shown in such positions, whether they exist or not. A mountain range may or may not divide drainage basins, and a divide may or may not consist of a mountain range.

Another mistake is the assumption that the highest peaks are always situated on the crest of the mountain range. This is their most common position, but in many cases the highest peaks are situated on spurs, at a distance from the crest.

We still find on many maps the main system of the Cordillera of North America represented as running in a direct line to the Arctic Ocean, just west of the mouth of the Mackenzie, in defiance of the

well-known fact that the main mountain system follows the coast through Alaska, and forms the backbone of the Alaskan Peninsula.

Many minor errors of a somewhat ludicrous character have been perpetuated in publications of authority, a few of which may be instanced:

For many years a town by the name of Goblin City appeared on the maps, placed on White River in western Colorado. It had no connection with other settlements; and, indeed, there were none within hundreds of miles. An enterprising map-maker, realizing that the inhabitants should have some means of communication with the outside world, made on his map a road from Goblin City eastward to other settlements, and this was afterwards carefully copied on other maps. A scientist who explored this region in 1876 looked for Goblin City, and found it. It was only a bit of Bad Land, to which an earlier explorer had fancifully given this name.

On the map of Colorado to-day appears the name Kahnah Creek, applied to a small branch of Gunnison river. The word *Kahnah*, in the Ute language, means, "I don't know," and was the answer given by an Indian when asked the name of the stream. This story is capped by the name Pah River, applied by an early army explorer to the North Fork of the Gunnison. It seems that, pointing to the stream, the explorer asked a Ute Indian its name. "Pah," answered the Indian. *Pah* is the Ute word for water.

Some years ago a Munchausen tale went the round of the newspapers to the effect that an explorer had discovered in the interior of New Guinea a mountain called by him Mount Hercules, and stated to be 35,000 feet high, thus exceeding Mount Everest in altitude by more than a mile. His narrative lacked certain elements of probability, as, among other things, the discoverer claimed to have climbed the great peak one morning before breakfast in an absurdly short time. His story was quickly discredited, but even now inquiries are frequently made concerning the existence of this purely mythical mountain.

RECENT CENSUSES OF POPULATION.

BY

HENRY GANNETT.

Within the last two or three years most of the civilized nations of the earth have made enumerations of their inhabitants. The results of these censuses are beginning to appear, and comparisons of them with one another and with that of the United States are instructive.

The following table shows the total population of a number of countries, as derived from recent censuses, with the rate of decennial increase and the density of population, expressed in terms of the number of inhabitants per square mile:—

COUNTRY.	DATE.	POPULATION.	PER CT. DECENNIAL INCREASE.	DENSITY OF POPULATION PER SQ. MILE.
United States	1900	76,303,387	21	26
England and Wales	1901	32,523,242	12	557
Germany	1900	56,345,014	14	269
France	1896	38,517,975	0	189
Spain	1900	18,078,497	3	92
Switzerland	1900	3,212,551	10	207
Norway	1900	2,231,395	12	18
Belgium	1900	6,744,532	11	593
Netherlands	1899	5,103,924	13	403
Austria	1900	26,107,304	9	225
Hungary	1900	19,200,000	11	153
Russia	1897	128,932,173	..	15
Sweden	1899	5,097,402	7	30
India	1901	294,266,701	3	188
Japan	1898	43,760,754	..	296
Chile	1895	2,712,145	7	9
Peru	1896	4,610,000	..	7
Denmark	1901	2,447,441	13	160

From the above there appears to be little relation between the density of population and the rate of increase, some of the most densely-settled countries apparently having as great a rate of increase as the most sparsely-populated ones. Thus, England and Wales, Belgium and the Netherlands, which are the most densely-settled portions of the civilized world, are exceeded in rate of increase only by Germany and Denmark among European nations; while, on the other hand, France, which is not a densely-settled country, according to European standards, is not increasing in numbers.

The rate of increase in the United States, although rapidly diminishing, is still 50 per cent. greater than that of any other nation here represented. Of the European nations, Germany shows the most rapid rate of increase, in spite of the large emigration from that country. Spain has practically come to a standstill, its recent census, taken in 1900, showing a few thousand less inhabitants than that taken three years earlier. The recent famines in India are doubtless responsible for the small increase in that country.

The proportion of urban population differs widely in different countries. Measuring it by the population included in cities of 100,000 or more inhabitants, it is seen that this element, which in the United States comprises 19 per cent. of the total population, includes in England and Wales not less than 34 per cent.; while in Belgium it is 18 per cent., in Germany 16, in France 10, in Spain 9, and in Japan 8 per cent. Thus, measured in this way, the United States comprises a larger proportion of urban population than any country in Europe, with the exception of England and Wales.

If, on the other hand, all bodies of urban population be included, which is a much better test to apply, the situation is different. Measured in this way, the urban population of the United States forms 40 per cent. of the total number of inhabitants; while that of England and Wales forms not less than 72 per cent., or nearly three-fourths of the entire population. In Germany and the Netherlands just one-half of the population is included in such urban bodies; in France, Switzerland and Belgium, two-fifths; in Denmark, 30 per cent.; in Norway, 28 per cent.; in Sweden, 21 per cent., and in Russia 12 per cent. Measured by this standard, therefore, the United States is exceeded among European nations by England and Wales, Germany and the Netherlands, and equalled by France, Switzerland and Belgium.

The proportion of urban population is an indication of the relative importance of manufactures and commerce as contrasted with agriculture. These figures emphasize the preponderance in England and Wales of manufactures and commerce, and the growing importance of these industries in Germany. The comparatively low proportion of urban population in France, coupled with its high density of population—far too great for a rural community—serves to explain, in part at least, the cessation of its growth. Rural communities cannot increase beyond a certain density of population. The vocations of the people must change or the population come to a standstill. The policy of the German Government in encouraging manufactures and commerce at the present stage of the development of

this country is a wise one, and the increase of this people in numbers in recent years is a gratifying response to the efforts which the Government is making in this direction.

We see in the United States, among the several States, all stages of this movement, ranging from a prosperous farming State to an over-populated farming State and a prosperous manufacturing and commercial State. By tracing the growth of population in certain of the older States, such as Massachusetts, all stages of this history may be seen in the course of its progress.

By considering these facts it is easy to explain the apparent anomaly of a rapid growth in population in a densely-populated country.

GEOGRAPHICAL RECORD.

PETRIFIED FORESTS OF ARIZONA.—In the Report of the Smithsonian Institution for 1899, just issued, is Prof. Lester F. Ward's account of the petrified forests in Arizona and their condition at the close of the year 1899.

Silicified wood is found in many parts of Arizona, New Mexico, and Utah, but the particular region known as the "Petrified Forest" lies in the area between the Little Colorado river and the Rio Puerco, 15 miles east of their junction, 17 miles east of Holbrook, and 6 miles south of Adamana station on the Santa Fé Pacific Railroad. It is about 8 miles square.

The region consists of the ruins of a former plain, with an altitude of 5,700 to 5,750 feet above the sea. The plain has been eroded to a depth of nearly 700 feet, and is cut into ridges, buttes, and small mesas, with valleys, gorges, and gulches between.

The strata are of clay-beds, sandstone shales, and massive sandstones. The clays are purple, white, and blue, the purple predominating; the sandstones chiefly of a reddish brown, though some are light-brown, gray, or whitish in colour.

The mesas are formed by the resistance of the massive sandstone layers to erosion, and vary in size from mere capstones to tables several miles in extent, stretching to the east and the northwest. The drainage is to the south, and in the middle of the area is the arroyo, which has been mistaken for Lieut. Whipple's Lithodendron Creek. The valley of this creek broadens out at the southern end; and here lies the principal petrified forest, known to some as Chalcedony Park. The petrified logs are countless at all horizons, and lie in the greatest profusion on the knolls, buttes, and spurs, and in the ravines and gulches, while the ground is studded with fragments of all shapes and sizes, exhibiting all the colours of the rainbow.

At the northern end of the area is another centre of accumulation, and two miles to the southeast a third, which is called the Middle Forest.

All these forests are, geologically speaking, entirely out of place, and the trunks bear evidence of having dropped down to their present position from a higher horizon.

Their original position is not to be discovered by ascending the mesas included in the area (though some of these rise 400 feet above

the bed of the creek), and it is only when the plateau is reached, 700 feet above the valley, that the stratum is found in which the fossil wood is embedded. On the west side the plateau is about two miles wide, and has a western escarpment, with another valley extending both south and west of it. This plateau, or elongated mesa, is highest on its western side, rising to the 5,750-foot contour line immediately above the escarpment; and here is exposed a fine series of petrified trunks fringing the mesa, with many weathered out on the slope or rolled down into the valley. A few feet below the actual summit is a bed, some twenty feet thick, of coarse, gray, conglomeratic, cross-bedded sandstone, at many places in which were firmly embedded logs and branches of petrified wood, often projecting from it in the cliffs and clearly in place. After several days' study on all sides of the area, Prof. Ward became convinced that this was the true source of the fossil wood.

At the extreme northern end of the area is a small mesa, at an elevation of nearly 5,700 feet. It is isolated, and its nearly flat top, of about half a mile in diameter, is a stratum of coarse conglomeratic sandstone, twenty to thirty feet in thickness, and in all essential respects identical with that of the elongated mesa on the southwest side of the area. The petrified wood, though less abundant here, is still common, embedded in the ledges.

One of the most celebrated objects in this whole region is the Natural Bridge. This is a great petrified trunk lying across a cañon 20 feet deep and forming a bridge. It is on the northeast side of the small, isolated mesa. The bed in which the tree lies is the coarse sandstone which holds all the petrified wood, and the Natural Bridge is one of the few logs that are in place.

The trunk is complete to the base, where it is abruptly enlarged, and shows the manner in which the roots were attached. The cañon is about thirty feet wide where it is spanned by the tree in a diagonal direction, with a measurement of forty-four feet between the points at which it rests on the sides of the cañon. The exposed length of the trunk is 111 feet, and its diameter, above the middle of the cañon, is over three feet; and at this point there is no incrustation of sandstone on the tree. As in the case of practically all the petrified logs of the region, there is no indication of limbs or branches at the top.

Many facts stand in the way of the supposition that the trees grew where they are found. It is stated by some writers that stumps occur erect with their roots in the ground, but Prof. Ward was unable to find an instance or to learn of one from the residents

of the country. The one tree which he found standing on end had its roots high in the air.

His conclusion is that the indications point to transportation of the trees by water, their accumulation in masses, and subsequent petrifaction.

Relic-hunters and enterprising manufacturers have done their best to carry off these stones. Prof. Ward talked with a teamster who was employed for a long time hauling trunks out of the upper forest to Carrizo Station, and was told by him that though many carloads had been shipped away there had been left at the station a much greater quantity, which had been carried off piecemeal by visitors.

Prof. Ward recommends that the region of these forests be declared a reserve and protected by law.

ACCORDING TO A REPORT of the U. S. Consul-General at Rio de Janeiro, there are now about 2,700,000 foreigners settled in Brazil. Of these 1,300,000 are Italians, 800,000 Portuguese, Germans 300,000, Spaniards 100,000, Poles 80,000, French 10,000, English 5,000, North Americans 500, and all other nationalities 100,000.

As a rule, the foreigners become Brazilians. The Consul-General declares that a small percentage of the colonists—1 or 2 per cent.—retains foreign nationality.

COMMERCE OF THE PATAGONIAN COAST.—The *Bulletin* of the Bureau of American Republics, Vol. X, No. 5, takes from a report of the German Consulate at Buenos Aires some data on the Territories of Chubut and Santa Cruz, in the southern part of the Argentine Republic. These Territories stretch over ten degrees of latitude.

Madrin, the port of the valley of Chubut, is at the head of Golfo Nuevo. In 1899 its exports amounted to 6,000 tons of wheat and 300 tons of wool, besides sheepskins and cattle. The wool is still often packed in bags. The wheat of Chubut is of excellent quality.

The State telegraph line now ends at Madrin, but is to be extended to other southern ports. A railroad is in operation between Madrin and Rawson, at the mouth of the Chubut river, and another, now under construction, will connect Madrin with the salt marsh region of the Valdez Peninsula. At present the bags of salt and the unpressed wool are piled up in the open air on the beach at the Piramides anchorage.

At Puerto Camarones, on the bay of the same name, the wool of the English, Swiss, and German sheep-farmers accumulates for months on the beach, waiting to be shipped.

All these ports are in Chubut.

At Puerto Deseado, the most northern port of Santa Cruz Territory, wool is the chief export.

Puerto San Julian is difficult of access at low tide.

Santa Cruz, at the mouth of the Santa Cruz river, consisted, three years ago, of ten houses. It has now 500 inhabitants and 100 houses and sheds. Its annual export of wool amounts to 1,000 tons, and it imports considerable quantities of wire and corrugated sheet-iron, provisions, lumber, etc.

The back-country, or hinterland, of Santa Cruz, is a magnificent pasture land.

The most southern port of this territory is Puerto Gallegos, with a population of 1,000, and an increasing trade in wool, tallow, prepared and fresh meat, pelts, etc.

These southern Patagonian towns keep up their communication with Europe through Punta Arenas, the thriving Chilian port on the Strait of Magellan.

The Monthly Weather Review, Vol. XXIX, No. 3, condenses the various reports of the storm, with red rain and red dust, throughout southern Europe early in March.

On the 10th of March there was a sirocco, with red dust, in the morning in Sicily, in the afternoon in southern Italy; on the 11th red and yellow dust fell with snow in Brandenburg and Pomerania, with east wind by midday, and on the lower Elbe and Weser with north wind by the evening of the 11th.

Prof. A. W. Rücker, who was at Taormina, reported in *Nature*, of March 28:

> On March 12 the sirocco was blowing and the hills were wrapped in mist, but the fog assumed a yellow hue, and the sun, which at times could be seen through it, was a bright blue; this was caused and accompanied by a copious fall of red dust. Some which I shook off my hat was quite dry, and on looking at it through a low-power lens all the granules seemed to be spherical, except a very few grains which looked like quartz . . . Italian papers state that the dust fell also at Naples and Palermo in such quantities that the streets looked red and the people were frightened.

The dust that fell in Germany was examined microscopically and chemically, and was found to be perfectly similar to the sands of the Sahara.

In Palermo the sky was covered with dark red clouds after 8 A. M. of the 10th of March. The city was bathed in red, and at noon-

time the drops of heavy rain looked like blood. At Naples, about 5.45 P. M. of the 10th, the sky became bright yellow and afterwards fiery red. The clothing of those in the street was entirely covered with dust. It was difficult to keep the eyes open. Nothing like it had been seen in Naples since the eruption of Vesuvius in 1872.

This is the first time that Sahara dust has been known to be carried to England.

La Géographie, of April 15, prints the following comparative table of the commercial movement of eleven ports in Western Europe:

1880.	TONS.	*1890.*	TONS.
London	5,970,341	London	7,708,705
Liverpool	4,913,324	Liverpool	5,782,351
Antwerp	3,063,825	Hamburg	5,202,825
Marseilles	2,769,047	Antwerp	4,506,277
Hamburg	2,766,806	Marseilles	3,458,914
Havre	1,969,857	Rotterdam	2,918,425
Rotterdam	1,681,650	Havre	2,159,213
Bremen	1,169,466	Bremen	1,733,809
Amsterdam	1,076,887	Amsterdam	1,484,250
Bordeaux	1,012,880	Dunkirk	1,256,518
Dunkirk	765,968	Bordeaux	1,091,097
1895.		*1899.*	
London	8,435,676	London	9,437,950
Hamburg	6,254,493	Hamburg	7,765,950
Liverpool	5,598,341	Antwerp	6,872,848
Antwerp	5,322,262	Rotterdam	6,323,072
Rotterdam	4,177,478	Liverpool	6,152,187
Marseilles	3,430,124	Marseilles	4,699,168
Bremen	2,183,274	Bremen	2,406,748
Havre	2,031,023	Havre	2,175,691
Amsterdam	1,281,669	Amsterdam	1,812,500
Dunkirk	1,178,243	Dunkirk	1,365,826
Bordeaux	799,201	Bordeaux	975,102

In the next three or four years London will probably lose the first place. Who would have believed ten years ago that the commerce of Antwerp or Rotterdam would so soon exceed that of Liverpool?

THE CENSUS OF IRELAND.—The returns show a population of 4,456,546; a loss since 1891 of 5.2 per cent.

Leinster has lost 41,297, Munster 98,568, Ulster 38,463, and Connaught 69,876.

Three counties—Dublin, Down, and Antrim—show an increase of 7 per cent. in the ten years. In every other county the population has diminished, the greatest decrease being 19.6 per cent. in Monaghan.

The number of Roman Catholics is 3,310,028, a decrease of 6.7 per cent. in the ten years; the Episcopalians number 579,385, a decrease of 3.5 per cent.; the Presbyterians are 443,494, a decrease of 0.3 per cent., and the Methodists are 61,255, an increase of 10.4 per cent.

Of the cities Belfast shows an increase of 28 per cent., Londonderry 20 per cent., and Dublin 7 per cent.

THE ITALIAN MINISTRY of Agriculture, Industry, and Commerce publishes the results of the Fourth Census of the population of Italy, taken on the 9th of February, 1901, compared with the data of the Third Census, made in 1881:

DIVISIONS.	POPULATION.		INCREASE.	YEARLY INCREASE PER 1,000.
	1881.	1901.		
Piedmont	3,070,250	3,326,311	256,061	4.4
Liguria	892,373	1,080,944	188,571	11.1
Lombardy	3,680,615	4,278,188	597,573	8.5
Venetia	2,814,173	3,130,429	316,256	5.9
Emilia	2,183,391	2,451,752	268,361	6.4
Tuscany	2,208,869	2,548,154	339,285	8.0
The Marches	939,279	1,064,749	125,470	7.0
Umbria	572,060	644,367	72,307	6.6
Latium	903,472	1,206,354	302,882	17.5
Abruzzi e Molise	1,317,215	1,442,365	125,150	5.0
Campania	2,896,577	3,142,378	245,801	4.4
Apulia	1,589,064	1,949,423	360,359	11.9
Basilicata	524,504	* 490,000	* 34,504	* 3.4
Calabria	1,257,883	1,375,760	117,877	4.9
Sicily	2,927,901	3,529,266	601,365	10.7
Sardinia	682,002	789,314	107,312	8.2
	28,459,628	32,449,754	3,990,126	7.3

* In the Basilicata the population diminished. The births for the period 1882–1900 exceeded the deaths by 80,266, but the emigration for the same period amounted to 168,978, and two-thirds of this number settled abroad.

Of the cities Bologna has 152,009 inhabitants, an increase of 28,735; Catania 149,694, an increase of 49,277; Florence 204,950 (increase 35,949); Genoa 234,800 (increase 55,285); Leghorn 98,505 (increase 890); Messina 149,823 (increase 23,326); Milan 491,-

460 (increase 169,621); Naples 563,731 (increase 69,417); Palermo 310,352 (increase 65,361); Rome 463,000 (increase 162,533); Turin 335,639 (increase 82,807); Venice 151,841 (increase 19,015).

THE CENSUS OF AUSTRIA-HUNGARY.—The *Deutsche Rundschau für Geographie und Statistik, No. 7, XXIII Jahrgang*, prints the results of the census in Austria-Hungary taken on the 31st of December, 1900, and compared with that of 1890:

	1890.	*1900.*
Lower Austria	2,661,799	3,086,382
Upper Austria	785,831	809,918
Salzburg	173,510	193,247
Styria	1,282,708	1,356,058
Carinthia	361,008	367,344
Carniola	498,958	508,348
Coast Land (Trieste, Istria, etc.)	695,384	755,183
Tyrol and Vorarlberg	928,769	979,878
Bohemia	5,843,094	6,318,280
Moravia	2,276,870	2,435,081
Silesia	605,649	680,529
Galicia	6,607,816	7,295,538
Bukovina	646,591	729,921
Dalmatia	527,426	591,597
Austria	23,895,413	26,107,304

The increase in the ten years is 2,211,891, or 9.3 per cent.

According to the Hungarian official returns, the population of Hungary proper on the 31st of December, 1900, was 16,792,399 (including 100,928 military), and that of Croatia-Slavonia 2,411,132. The percentage of increase in the ten years was: Hungary 10.03; Croatia-Slavonia, 9.5.

The total population of the Monarchy at the close of the year 1900 was:

Austria	26,107,304
Hungary	19,203,531
Occupied Territory (Bosnia and Herzegovina)	1,589,165
	46,900,000

THE HUNGARIAN GOVERNMENT intends opening a waterway from the Oder to the Adriatic Sea. This will require the canalisation of the Oder from Kosel to Oderberg, a length of 43½ miles. From

Oderberg the line will cut through the watershed above the Iablunka Pass, continue to Sillein, and reach the Danube at Komorn. It will then follow the Danube to Vukovar and the Samac Canal to the Save river, and along this for 180 miles to Karlstadt, or Brod, on the Kulpa. From Brod to Fiume a canal of 35 or 40 miles in length must be constructed.

The length of navigation from Stettin to Fiume will be 1,370 miles, 870 of which are by natural waterways.

This canal will be of great advantage to the German trade with the Levant, and will make Fiume and Budapest important centres of international commerce. (*Geographische Zeitschrift, VII Jahr. 5 Heft.*)

Dr. Theobald Fischer, of Marburg University, publishes in the *Ergänzungsheft*, No. 133, of *Petermanns Mitteilungen* the scientific results of a journey made in Western Morocco in 1899 in company with Count Pfeil and Capt. Wimmer.

Landing at Tangier, Dr. Fischer made some geological excursions in the neighbourhood, and then took ship for Mogador, from which place he followed the route through the Tensift Valley to Marrakesh. Between Mogador and the mouth of the Tensift is the range of the Jebel Hadid or Iron Mountain, 30 miles in length and 2½ miles broad.

The country between the sea and Marrakesh is a characteristic steppe. From Marrakesh the march was to the eastward as far as Demnat, which is situated on an outlier of the Atlas at an altitude of 3,200 feet. Here Dr. Fischer turned to the north to the Umer-Riba. This valley, like that of the Tensift, is cut through a steppe. Beyond this, still to the north, begins the zone of cultivated land, of an amazing fertility, parallel with the coast from El-Arish to Mogador, and with a breadth of between fifty and sixty miles.

Following the coast, the expedition returned to Tangier.

What Dr. Fischer calls the *Vorland* of the Atlas is divided into three natural zones: that of the oases, watered by the streams from the Atlas, and inhabited by an industrious population, who live on the products of their orchards; the steppe region, partly mountainous and furnishing pasturage for flocks and herds; and then the cultivated strip along the coast, which Dr. Fischer will study in a new expedition to be sent out by the Hamburg Geographical Society.

In 1892 the interior of Dahomey was an unknown country, but its exploration, begun immediately after the war, has now been nearly completed.

Lower Dahomey was first mapped. The capture of Behanzin opened the country of the Mahis. The establishment of the post of Carnotville, in 1894, was followed by the exploration of Gurma and by the surveys made between Carnotville and Bussa on the Niger, the place where Mungo Park met his death. Lieut. Hourst's Niger expedition completed the topographical reconnoissance of Upper Dahomey; and in 1896–97 the central regions, Borgu and middle Gurma, were explored by Captains Baud and Vermeersch, who determined the orography of the Atakora Mountains, the watershed of the country. From this mountain-knot, rising to a height of a little more than 3,000 feet, flow the streams which find their way to the Bight of Benin, to the Volta river, and to the Niger. By the junction of Capt. Baud's party with that of Voulet the Dahoman routes were united with those of the French Sudan.

A map of the country of the Baribas, the work of Lieut. Boissonas, fixes the course of the affluents of the Niger between Say and Ilo, and corrects the positions of the kingdoms of Bonay and Kandi. The points of the Franco-German frontier between Dahomey and Togo have been marked. With the surveyed line of the future railroad to the north, and the delineation of the Franco-English frontier, between Dahomey and Lagos, there will be nothing wanting to acquaintance with the geography of Dahomey. (*Revue Française, Avril.*)

THE TWENTY-NINTH issue of the List of Chinese Lighthouses, Light-Vessels, Buoys, and Beacons, published by the Imperial Maritime Customs, gives the name and location of 112 lights along the coast and in the Yangtze river, from Hoi-how, in the island of Hainan, to Newchwang, in Manchuria. There are also 87 buoys and 78 beacons.

THE PEARY ARCTIC CLUB'S EXPEDITION.—Mr. H. L. Bridgman, Secretary of the Peary Arctic Club, sends the following communication:

NEW YORK, *June 12, 1901.*

To the Members of the Peary Arctic Club:

The following memorandum is respectfully transmitted for your information. Mail for Etah, Greenland, and all points north, will close at the Standard Union office at noon, July 10.

H. L. BRIDGMAN,
Secretary.

The Peary Arctic Club has entrusted to its secretary, Herbert L. Bridgman, the command of its expedition of 1901, the fourth of the series since Mr. Peary departed on his attempt to attain the Pole. This will be Mr. Bridgman's third cruise to the Arctic, the first having been as a member of the Falcon Auxiliary Expedition of 1894,

and the second in command of the Diana Expedition of 1899. Dr. Frederick A. Cook, of Bushwick Avenue, surgeon of the first Peary, 1891, and of the Belgian Antarctic Expedition, has accepted the position of surgeon, and will, on the cruise, prosecute his studies of the ethnology of the Arctic highlanders of North Greenland. The club's chartered steamer *Erik*, formerly the property of the Hudson Bay Company, now belonging to Capt. James A. Farquhar, of Halifax, N. S., having been thoroughly overhauled and refitted, is now on her way from London to St. Johns, N. F., where the captain and crew will be shipped, whence she will proceed for Sydney, C. B., for coal and supplies, taking her departure from that port direct for the North about the middle of next month. A touch of romance is connected with the *Erik's* service, her owner and commander for next summer first meeting in Halifax, N. S., in June, 1897, the captain at that time commanding the mail steamer *Harlaw*, which was then in port. A year later Capt. Farquhar's *Newfoundland*, laden with flour, sugar, pork, and other stores, while in Cuban waters looking for a cargo of sugar, was seized by a United States gunboat as a blockade runner and towed into Charleston, S. C. The secretary of the Peary Arctic Club telegraphed to Capt. Farquhar offering assistance, which was not, however, availed of, and after due investigation the *Newfoundland* was released. But out of the incident grew a friendly relation, which culminated in the placing of the *Erik* in the service of the Peary Club. Capt. Farquhar will take stores for one year to guard against any possible detention, and will, with authority from the Royal Greenland Trading Company to land, call at Godhavn and Upernavik, the most northern stations for any possible information of Peary. The *Erik* is certified by the highest marine authority in London to be in the best condition and well adapted for her Arctic work, and is pronounced by Capt. Farquhar to be in every respect superior to the *Hope* or the *Diana*, which have both been used in the Peary service. Capt. Grey, master of the *Erik* for more than fifteen years, says that she is a very fine sea-going ship, and does good work in the ice. George H. Carr, a member of Peary's 1893–94 party, after a personal inspection the other day of the ship, reports :

"Beginning aloft, so far as I could ascertain, all of the rigging, spars, masts, etc., are in first-class condition. The foremast and mainmast are entirely new, and the mizzenmast is, I understand, only two years old. In the forecastle the crew's accommodation is far better than that in the *Falcon*, being much lighter and better laid out. The forecastle contains sixteen berths and room for a good, large stove for winter use. Under the crew's quarters is a large stock room, which, of course, will come in very handy. There is also a carpenter's shop and blacksmith's shop, both of them limited in size. In addition to the crew's quarters in this part of the vessel there is sufficient room for about eight other persons, and I take it that these quarters would be used by the officers of the ship, since there is no deck-house, as was the case in the *Falcon*. The hold of the ship is quite large and roomy, and well reinforced throughout with heavy timbers, which have evidently been recently put in. The ship's sides are, I understand, double-sheathed, and therefore in pretty good shape to stand an ordinary ice squeeze. A pair of new knee braces had been put in. The cross timbers in the hold are of good, solid oak, although looking somewhat the worse for wear. The ship is quite tight and makes no water; in fact, when I was in the hold there was little or no bilge to be seen. The bridge is wider than was the *Falcon's*, and the officer's quarters in the afterpart of the ship are more conveniently laid out than in the *Falcon's*, the captain's room being especially large and roomy; it not only boasts of a washstand, but quite a large couch also. There are about six feet of space between the berth and the door. The three other cabins leading off the saloon are

fitted with double berths, and are also much roomier than were our quarters on the *Falcon*, where one of us turned out at a time in order to dress. The *Erik* has a complete new suit of sails; this is in addition to her present suit. The chart-house, which is situated under the bridge, is very small. However, there is room in it for a single berth. The engines are being thoroughly overhauled, the condensers going through a thorough state of cleaning, scraping, etc. Six tons of coal per day give an average of 7½ knots per hour. This is about the same speed as the *Falcon*. Peary has already seen the *Erik*, and in fact wished to buy her from the Hudson Bay Company prior to Harmsworth's gift of the *Windward*. Capt. Grey, who has always sailed this ship, states that she is very easily handled in the ice. She has a double wheel to her rudder, thus allowing four men to handle her should a necessity arise."

The provisional project of the cruise, so far as arranged, is as follows:

1. Leave Sydney, C. B., July 15, or as soon after as practicable, and proceed as rapidly as possible to Etah, North Greenland, mailing home letters from Domino Run or other convenient Labrador port, and Godhavn, and calling at Cape York, Saunders Island, and other native settlements for news from Peary.

2. Effect junction at earliest possible moment with *Windward*, deliver mail, and, if necessary, transfer stores and coal.

3. Peary's verbal or written instructions will supersede the foregoing, and are, as far as possible, to be fully and faithfully performed.

4. Relieve Stein's Fort Magnesia, Payer Harbour, Bedford Pim Island, unless earlier meeting with Stein and Warmbath should render this unnecessary.

5. Deliver mail for the *Fram* at most convenient point without interfering with the general duties of the expedition.

6. Furnishing directly or indirectly written or photographic matter for publication; trading with natives, scientific or sporting excursions, except by express permission by representative of Peary Arctic Club, are forbidden.

7. Leave Etah for Northern port, Aug. 27 or 28, and return to reach Sydney not later than Sept. 15.

8. Subject to the discipline of the ship and the conditions of navigation, the authority of the representative of the Peary Arctic Club is paramount, and in event of his disability, and in absence of other directions from Peary, shall devolve upon surgeon, and then upon the captain and officers in order of rank.

The summer of 1901 is likely to mark the culmination of the work of the Peary Club, though its members, confident as they have been from the outset in Mr. Peary's success, are pledged to stand by him unfalteringly to the end. Three years have elapsed since Mr. Peary left America, and two full seasons' work is to be learned upon the return of the *Erik*. More interesting, in a personal and dramatic way, than the geographic work of Mr. Peary, is the fate of his wife and daughter and of the steamer *Windward*, from which nothing has been heard since her departure from Godhavn, Greenland, Aug. 20, 1900. Expectations and instructions then were that the *Windward*, with Mrs. Peary and Miss Peary, would return in the autumn, and the hope now is that their detention was due to Mr. Peary's orders, and for reasons which were satisfactory to him. The *Erik* will take to Mr. Peary, for the first time, news of the death of his mother in Portland, Me., last November; of the Baldwin-Ziegler Expedition, and many other facts of personal and general interest. Prof. L. C. Stone, of the Polytechnic Institute, and Herbert Berri, his pupil, of Brooklyn, son of Mr. William Berri, will be guests of the Peary Arctic Club on the cruise.

XUM

THE BALDWIN-ZIEGLER POLAR EXPEDITION.—Prof. E. B. Baldwin, the leader of this expedition, left New York on the 14th of June, in the *Friedrich der Grosse*, accompanied by Mr. William Ziegler, who supplies the funds for the enterprise.

It is understood that the start will be made in July from Tromsö, Norway, and that a base will be established in the Franz Josef archipelago.

Practically all that is known as yet of the plans is contained in the following report of Prof. Baldwin's remarks at the dinner of the Arctic Club on the 24th of May. In accepting an American flag presented to him, Mr. Baldwin said:

I am firmly convinced that this flag will be carried to victory in this expedition. I am unable to say much at this moment of the plans which have been decided upon. The starting-point will be Franz Josef Land, and our party will be sufficient in number to avail ourselves of every resource in the land, in the way of food, by hunting bears and other animals. We shall begin our journey across the ice with 400 dogs and fifteen Siberian ponies, and with the assistance of these I believe it will be possible to achieve the object we shall set out to accomplish. With the proper management of our large pack of dogs I don't see why we should not succeed in carrying the Stars and Stripes to the North Pole. We also hope to do a great deal of scientific work. Comrades will be engaged for this branch of our operations who have had Arctic training. I would like to be able to name the men who will comprise our party, but there are several reasons which prevent me making known the personnel of the expedition at this time.

The expedition is supplied for three years, though it is said that Mr. Baldwin expects to reach the Pole and return within twenty-seven months.

At the end of two years a supply of food and material will be sent to Franz Josef Land, and the party will remain in the Arctic until its purpose is accomplished.

The daily papers published on the 12th of June the following dispatch:

QUINCY, Ill., June 1.—Forty balloons have been shipped to Tromsö, Norway, where the outfit will be added to the equipment of the Baldwin-Ziegler North Pole expedition.

These are not for carrying passengers, but to mark the path of the expedition. To each will be attached ten buoys, ten feet apart, hanging one below the other, weighing ten pounds each, and arranged with a liberator for detaching the buoys one at a time as they strike the earth. Each buoy will contain a message, showing the latitude where the balloon was sent up, and such other words as the explorers care to leave behind.

The buoys are made of copper and cord, and are shaped like a top. In the centre is a hollow space, which will contain the messages. When a certain amount of gas has escaped the balloon will descend. As soon as it gets near enough to the earth for one of the buoys to strike, the lower one is immediately detached, and, liberated from the weight, the balloon at once begins another ascent. This operation is re-

peated automatically, until all of the buoys have been dropped, when the balloon, now emptied of its gas, collapses, and sinks to the ground. As there are forty of these, this operation will be continued until the 400 buoys are scattered over the Arctic regions.

NINE EXPEDITIONS are now in the Arctic, or on the way thither :

R. E. Peary's expedition, including the *Windward.*

Admiral Makaroff's party in his ice-breaker.

Robert Stein's party in Ellesmere Land.

Capt. Sverdrup's expedition in the *Fram.*

The search-party, led by Mr. Stökken, to learn the fate of the three men lost from the *Stella Polare.*

Capt. Bernier's Canadian expedition, following the route of the *Jeannette.*

Baron Toll's expedition to the Taimyr Peninsula.

Capt. Bauendahl's party in the fishing-boat *Matador.*

The Ziegler-Baldwin polar expedition.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, May 20, 1901.

The oldest and the most important of all the geographical institutions of an official character existing in France is the Geographical Service of the Army, which depends upon the Ministry of War. I propose to sketch the history of this institution for the members of the American Geographical Society, reserving for another letter an account of its present organization.

The name which it now bears is of recent date. Up to the year 1887 it was known as the *Dépôt de la Guerre*, the designation bestowed at the time of its creation in 1688 by Louvois, the Minister of Louis XIV. The original Dépôt de la Guerre was, however, nothing more than a repertory of documents collected from the archives of the Ministry of War and specially relating to military history and operations; its director (who took charge in 1736) did not in any way concern himself with questions of topography. So matters remained until 1761, when the Dépôt of Maps and Plans was annexed to the Dépôt de la Guerre, in which were then brought together very valuable collections of printed and manuscript topographical drawings, the work of the military engineers in the reigns of Louis XIV. and Louis XV.

The history of this body—the *Corps des Ingénieurs des Camps et Armées*—would be curious and most interesting from a geographical point of view, and I may perhaps return to it in studying the origin of the map of the General Staff. At present it is enough to say that in 1761 the Dépôt de la Guerre did not undertake the production of maps. It was not until 1793, when the National Convention confided to it the retouching and the completion of the great geometrical map of France, known as the Cassini map, that the Dépôt de la Guerre took a new form. A former geographical engineer, Calon, a member of the Convention, held the office of director until 1797, and under him was organized for the first time a studio of topographical engraving, which has worked without interruption to the present day.

For a long time the Dépôt de la Guerre had its own individual government, but in 1845 it was attached to the central administration. It formed a special department in the Ministry of War down to the year 1871, when it was attached to the General Staff of the Minister—at first with the title of Fifth Bureau, afterwards with

that of Sub-Direction, and at last it received in 1887, when it had existed for 200 years, its present name.

The character of its work will be treated hereafter. A few figures will sufficiently indicate the importance of this establishment, as regards cartography, in the course of the XIX century.

In 1801 the Dépôt de la Guerre possessed and kept on sale 6 engraved maps; in 1889 it had 250, embracing 1,800 plates, the issue of which has gone on increasing, so that, according to the notice published at the time of the Exposition of 1900, nearly 900,000 sheets were sold in 1899, partly to regular agents, partly for purposes of study or for field manœuvres.

The Thirty-ninth Session of the Congress of Learned Societies, organized by the Ministry of Public Instruction to meet every year, either in Paris or in some important city of France, was held at Nancy on April 9–13.

In two of the sections—that of the Sciences and that of Historical and Descriptive Geography—some communications deserve particular mention in this place.

M. Julien Thoulet, whose work in oceanography is universally known and appreciated, presented his superb lithological map of the French coasts and a very interesting map of the Azores. M. Bouquet de la Grye, the distinguished hydrographical engineer, who has lately made a series of exact observations on the currents along the western coasts of France, explained his inability to find in the experiments made by the Prince of Monaco anything more than meteorological indications; the floats dropped from the *l'Hirondelle* and the *Princesse Alice* giving in reality only the direction of the wind, and not in any sense that of the marine currents.

M. Emile Belloc, well known to Alpinists for his geological and limnological studies in the Pyrenees, described his patient and careful researches on the circulation of subterranean waters.

In local and regional geography, M. Auguste Pawlowski submitted a study of the bay of Poitou, presenting exact information and new facts in topography and toponymy; M. L.-A. Fabre read a paper on the Adour and the plateau of the Landes, and M. Turquan a study of the migrations from department to department in France.

Particular attention was naturally paid to Lorraine. M. Pierre Boyé wrote on the Hautes-Chaumes of the Vosges; M. Bleicher* pre-

* This eminent man of science, the head of the School of Pharmacy in the University of Nancy, was killed in that city on the 8th of June. The telegram printed in the London *Times* of June 10 says: "He was murdered yesterday by M. Ray-

sented several geological studies of the plateau, as well as of the age and the formation of the valleys of the Meurthe, the Moselle, and the Meuse through the oölithic barriers, etc.; and several engineers gave the results of economical studies. M. Villain, for instance, demonstrated the extreme richness of the mining basin of Lorraine (5,000,000,000 tons), the richest in the world after that of Lake Superior, and pointed out the great facilities which exist in Meurthe-et-Moselle for development. M. Arth described the importance of the metallurgical production of Lorraine, M. Petit the brewing industry in the east of France, and M. Lebrun defined the salt basin of Lorraine as almost coincident with the Triassic, and considered the salt question in the department of Meurthe-et-Moselle. Exclusively geological papers were those of M. Bresson on the structure of the ancient *massif* of the Hautes-Corbières, M. Fabre on the Pyrenean origin of the magnetite in the sands of the Garonne, and M. Belloc on the lacustrine bars in the region of Oô, Department of Haute-Garonne.

M. Pawlowski described his discovery of a number of original maps by the geographer Claude Masse; and Dr. Hamy, President of the Société des Américanistes, communicated a series of interesting unpublished documents which clear up a number of points hitherto little known concerning the French expeditions to Florida, and particularly with regard to Laudonnière. Among these is a miniature found by M. Schlumberger at the chateau of Courance; it is the work of Lemoyne de Morgues, one of the artists who illustrated the De Bry collection. The miniature represents Laudonnière with the Indian Chief Satouriona before the stone pillar with the arms of France, set up by Jean Ribaut in 1562 before his departure for France. M. G. Saint-Yves spoke of the papers of Dumas and their importance for the history of the loss of Canada, and analyzed a portion of the correspondence of Patoulet relating to the French Antilles under Louis XIV. M. G. Musset traced, with the help of new documents, the history of the foundation of New Orleans; and Messrs. A. A. Fauvel and Henri Froidevaux spoke of some points, as yet little known, in the ancient explora-

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mond Four, a chemist, a sample of whose cinchona had been seized for analysis at the school, and who, dreading the results of prosecution for fraud, decided to hold the director of the school responsible for his humiliation and mischance. He called yesterday upon M. Bleicher, and after a long interview shot him dead and then committed suicide."

This crime recalls that of Prof. Webster in the chemical laboratory of Harvard University, in 1849.—(Ed. BULLETIN.)

tion of Africa. Messrs. Jules Beaupré, Henri Javard, and Collinet treated subjects of historical geography.

Among the visits and excursions particular mention must be made of that to the remarkable oceanographical laboratory organized by M. J. Thoulet at the Faculté des Sciences, of Nancy. It is to be regretted that the question lately raised in the *Annales de Géographie*, by M. Bleicher, was not taken up at Nancy; a boring made would have enabled the geologists and geographers present to discuss the matter on the spot, and to find a solution of the question whether the Moselle has really been captured by the Meurthe to the detriment of the Meuse.

Simultaneously with the meeting of the Congress at Nancy the International Association of Merchant Shipping celebrated its first meeting at Monaco, from the 12th to the 15th of April, and the Prince of Monaco announced that the sum necessary for the foundation of a meteorological and oceanographical observatory at the Azores had been voted by the Portuguese parliament, and that the first stone would be laid by the King of Portugal in the summer.

The principal geographical event, since the date of my last letter, is the reception of M. Gentil, explorer of the Shari river and Lake Tchad, and Capt. Joulland, the head of the Central African expedition, by the Société de Géographie. The meeting took place on the 14th of May at the Sorbonne, under the presidency of M. A. Grandidier.

M. E. Gentil explained in a masterly address the occupation and the organization of the territories on the Tchad—that is to say, the countries between the 10th degree of N. latitude and the left bank of the Ubangi. To the south are the civil territories, now fairly well known in their details, and M. Gentil now sets before us the delimitation of the river basins, the Kemo, the Nana, the Gribingui, the Ombela, and the M'Poko, the identification of the Bahr Sahara with the River Wam (already partly ascended by M. Perdrizet), and the determination of the navigability (for canoes) of the Fafa, affluent of the Wam. The principal ethnic groups in the civil territories, where the density of population is from 18 to 25 per square mile, are the Banda, the Mandjia, and a part of the Sara. All the tribes of the country are pagan; the Banda the most intelligent and the most warlike, the Mandjia the most industrious, of the natives. Between the southern frontier of Baghirmi and the civil territories lie the military territories, peopled principally by Mohammedans, who have been studied by Captains de Cointet, de Lamothe, and Galland.

A plan of the Shari at the stage of low water completes that made of the river at full in M. Gentil's first journey; and a new advance was made to the Tchad, the waters of which are navigable at every season for those who do not approach the shore nearer than two or three miles, at which distance there is a depth of ten feet, increasing to much more farther out and on the west side, while there are numerous sandbanks on the east. Unfortunately, M. Gentil was not able to go to the islands in the lake where the Bouddouma pirates live.

The greater part of the principal positions, nearly 200 in number, has been astronomically determined, and the map now in process of execution at the Ministry of Colonies will repose upon a scientific basis, and cannot fail to be of great service for the study of these regions, which are described as abounding in cattle and in all kinds of grain, while the numerous population produces leather and manufactured stuffs, and consumes European goods, sugar, coffee, tea, hardware, perfumes, soaps, etc.

Capt. Paul Joalland, who succeeded M. Gentil, explained how, after the sad events of July 17, 1899, and the departure of Lieut. Pallier, he considered it his duty to continue his march to the eastward. After having reorganized at Zinder the Voulet-Chanoine mission, he set out, October 3d, towards Lake Tchad, where he arrived, completing on the way his study of the Franco-English frontier in the Sudan. He then passed round the northern, eastern, and southern shores of Lake Tchad, effected a junction with the parties of Foureau and Gentil, and co-operated in the destruction of the empire of Rabah. In this way was realized, point by point, the programme laid down by the French Government for the regretted Col. Klobb.

Captain Joalland did not state the geographical results of his journey, and it will be some time before they are known. It is possible, however, to note in his account something of the races of the countries visited in Central Africa, and some economical facts on the country of Zinder, of which a nearly complete map has been drawn. It is, in the words of the traveller, the pearl of the French colonial empire in Central Africa, a country with an admirably healthy climate and a rich soil, in which wheat, the lemon tree, millet, maize, rice, the date-palm—in a word, all the products of the Sudan—grow in abundance. Captain Joalland believes that it has before it a great future, if not for large colonial enterprises, at least for the smaller proprietor.

A communication made by M. de Lapparent, both to the Académie des Sciences and to the Société de Géographie, is on the dis-

covery of a fossil bear by Col. Monteil on the 11th of September, 1892, in the Sahara, at Zau Saghaïr, in 18° 23′ 08″ North Latitude. In the discovery of this bear, picked up at the point where Gerard Rohlfs indicates the existence of *fossils*, M. de Lapparent sees a precious confirmation of the distinguished German's note; from the fact of the presence of this fossil in the eastern Sahara he concludes that there has been an error in regarding Africa as a rare example of continental stability indefinitely maintained. To-day (he writes in *La Géographie* for April) we are obliged to admit that in the Cretaceous epoch the territory of north Africa was greatly reduced; and as we know absolutely nothing of the geology of the countries situated between the Tchad on one side and the Kamerun and the Congo on the other, there is nothing to forbid the supposition that through some strait the Saharan gulf, which reached the region of the Tchad, might be in communication with the seas which bathed at the same moment, one, the coast of Libreville, the other, Shoa and the country of the Gallas. Such is the interesting statement made by M. de Lapparent. It was not received without scepticism and protest. Was this bear *in situ*, as the learned geologist affirms; or was it not carried by a caravan to the spot where Col. Monteil saw it before him and picked it up? This question is of capital importance, and it is only, as M. de Lapparent has very well said, from a detailed exploration of the strata scattered between Agadem and Bilma that we can look for its solution. In any case here is a new geological and geographical problem clearly stated, a new point to which the attention of the travellers in the Sahara is called. Perhaps—for the question has its interest on the other side of the Tchad—the specialists who accompany Comm. Destenave in the territories between the Ubangi and the Tchad will find there precious elements for the solution of this problem.

It is proper to say something of newly-formed expeditions. Dr. F. Weisgerber, whose interesting studies on Morocco have been previously noted, has published in *La Géographie*, with a map, a very good itinerary from Salé to Tangier by Mequinez, Fez, Alcazar, and Tetuan. Col. Peroz, who was charged with opening a route from Saï to Zinder through French territory, began by organizing the western part of the military territories in the French Sudan. Not content with bringing under the domination of France a population of more than 100,000 souls, he drew a map of the country, pushing his reconnoissances in every direction, and established the centre of administration at Sorbo-Haoussa, a village on the Niger a little below Sansané-Haoussa.

M. Charles-Eudes-Bonin has just set out for eastern Asia, where he intends making a new journey of exploration.

M. Piroutet has gone to New Caledonia for the purpose of studying the geological construction and the principal mining centres. He is to inspect the regions thought to contain mineral riches, and to construct a complete geological map of the colony.

Comm. Bourgeois, the head of the Commission to revise the arc of the meridian at Quito, has taken his departure. We shall report with care to the American Geographical Society the progress of this important operation.

No geographical publication seems to call for particular mention at the moment; but it is well to record a modification in the aims of the *Revue de Géographie*, resulting from the death of its founder, the regretted Ludovic Drapeyron. When he began the publication, in 1877, he designed to make it an organ of sound, popular instruction in geography, but he had been brought, by absorption in his professional duties in a lyceum in Paris, to devote much space in the *Revue* to studies in the history of geography and to historical geography.

As now published the *Revue* is edited by a committee, composed of General Niox, Emile Levasseur, of the Institute, Prince d'Arenberg, president of the Comité de l'Afrique Française, and M. Charles-Roux, president of the Comité de Madagascar. The secretary is the erudite and well-informed M. G. Regelsperger, who devotes his attention to questions of the present day, to the exclusion of purely retrospective studies. From this time on, therefore, the *Revue de Géographie* will publish papers on descriptive and economical geography, and will keep its readers informed of the progress in the knowledge of the globe, and the part taken by each people and race and the methods employed by them in developing and increasing the value of their domains.

This programme has been strictly followed since the month of March; yet, for our own part, we must regret that the *Revue* has so completely broken with what but recently constituted its principal merit. Henceforth it is to the *Bulletin de Géographie Historique et Descriptive* alone that we must look for the regular publication of studies in the history of geography and historical geography.

The summary report of proceedings at the Eighth International Geological Congress, held in Paris, August 16–27, 1900, has just been distributed. Necessarily brief as the notices are, they show the interesting character of the papers, such as that of M. Bleicher on the Denudation of the Vosges, those of M. Flamand (on the

Geology of Southern Algeria and the Saharan Regions), those of M. Douvillé (on M. de Morgan's Explorations in Persia and on the Jurassic Terrain in Madagascar), and that of M. W.-F. Hume on Sinai. There may be occasion to consider somewhat more at length the facts presented in these several studies when the detailed Report of the session is issued.

HENRI FROIDEVAUX.

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MAY–JUNE, 1901.

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BOOK NOTICE.

Tarr and McMurry's Geographies. Third Book, Europe and other Continents. The Macmillan Company, New York, 1901. 12mo, pp. 574, figs. 436.

The authors of this book are Professor R. S. Tarr, of Cornell University, and Professor F. M. McMurry, of Teachers College, Columbia University. This volume completes the proposed series for grade schools. Volume 1, Home Geography and the Earth as a Whole, and Volume 2, North America, were noticed by the present writer in this *Bulletin*, Vol. XXXII, 1900, pp. 388–390. The same modern point of view and the same attractive excellence characterize this, as the earlier numbers of the series. If such a course as is here outlined could be well taught in the grades more advanced work could be offered in the high schools than now seems possible.

Part I of the volume before us, comprising 95 pages, is devoted to a review of general geography. The instruction is, however, carried to a more advanced point than in the previous volumes. Thus, bare review and mechanical repetition are avoided. A very valuable feature appears as soon as the continents and their countries are taken up, viz.: constant comparison of the facts and principles found in other parts of the world with similar matters in the United States. This method is emphasized by a series of questions at the close of the treatment of each continent.

The space seems to be well allotted, as follows: General Physiography, 95 pp.; South America, 53 pp.; Europe, 204 pp.; Asia, 62 pp.; Africa, 46 pp.; Australia and Island Groups, 25 pp.; Review of North America, chiefly of the United States, 37 pp.; Comparison (partly diagrammatic) of the United States with other countries, 19 pp. There are appendixes of references and statistical tables, and the index is also a pronouncing vocabulary.

The illustrations are very abundant. While, as a whole, they are highly useful and interesting, it would, perhaps, have been well if the authors had attempted a little less and had secured a higher average of excellence. A number of views, containing human figures, are too much reduced. Such are figs. 47, 51, 52, 97, 180, 267, 305, 307, 334. Other illustrations are open to the same criticism, as the tropical forest, fig. 40; the Bolivian plateau, fig. 79;

tropical forest, fig. 86; City of Caracas, fig. 96; cliff dwelling, fig. 160; the Alhambra, fig. 165; the Berlin map, fig. 196; Paris map, fig. 162; Lake Lucerne, fig. 205; Hungarian Plain, fig. 223; Olive grove, fig. 240; farm house in Thibet, fig. 245.

Both the coloured and the relief maps are good in expression and attractive to the eye. In one or two cases map questions are asked, for which the maps themselves afford inadequate data. This is seen in the questions on p. 301, relative to the rivers and lakes of the Alps. One or two slips were observed. Thus, Lake Lucerne can hardly be called "star-shaped" (p. 308) when taken as a whole.

These minor criticisms, however, in no way obscure our appreciation of the excellence of the work. A reading of the several chapters will show the careful attention given to this preparation, the fullness of fact, and the adaptation to the work of the classroom.

We have space for but an illustration or two. Take, for example, under South America, the account of Argentina, the reasons for its growth as compared with Brazil, the comparison of the pampas with the North American prairies, and the discussion of the development of Buenos Ayres and New York. Or, if we select Germany, we find a good review of her growth, her enterprise, and of the latter as related to public education. How fresh and modern the story is appears in the emphasis placed on the beet-sugar industry, forestry, the rise of commerce, and the growth of German cities. It will be interesting to see whether such an excellent series of geographies will be hampered in their introduction by comparison with books of the old atlas form which have so long held sway in American schools.

A. P. B.

NOTES AND NEWS.

DR. REGINALD A. DALY has given up his projected expedition to Labrador, Greenland, and Iceland.

THE INTERNATIONAL CONGRESS OF AMERICANISTS will hold its Thirteenth Session in the City of New York in 1902.

The Anthropological Section of the American Association for the Advancement of Science, at its last meeting, appointed Messrs. F. W. Putnam, of the American Museum of Natural History, J. W. Powell, of the Bureau of American Ethnology, and G. A. Dorsey, of the Field Columbian Museum, a committee to organize a General Committee throughout the country to prepare a programme for the meeting.

THE ROYAL NETHERLANDS GEOGRAPHICAL SOCIETY is organizing an expedition, under the charge of Major L. A. Bakhuis, to explore the valley of the Kopename river, in Dutch Guiana.

THE SURVEY OF GREECE, interrupted by the war with Turkey, is now resumed under the direction of Prof. Hartl, of the University of Vienna.

DR. ROBERT BELL, for more than forty years a member of the staff of the Geological Survey of Canada, succeeds the late George M. Dawson as Director of the Survey.

PROF. GEORGE DAVIDSON, of the University of California, contributes to *Mazama*, for April, the explanation of a map of the rivers, lakes, trails, and mountains from the Chilkaht river to the Yukon, drawn for him by the Chilkaht chief Kohklux.

This chief planned and carried out in 1852 the destruction of the Hudson's Bay Company's station at Fort Selkirk because the agents of the Company had interrupted his traffic with the Indians of the interior. In 1869 he was a captive at Sitka, where Prof. Davidson, then on his way to observe the solar eclipse of August 7, made his acquaintance.

Kohklux, when released, promised assistance and protection to the eclipse party, and fulfilled his promise in spirit and in letter. He was honest as well as truthful, and not a single article was lost by the white men during their stay at his strong village of Klu-kwan.

The map was drawn by Kohklux and his two wives on a sheet of paper, 43 x 27 inches, and it cost two or three days' labour. Prof. Davidson finds it important in a number of places for the Indian names of natural features, and he has embodied its information in the map accompanying his paper.

THE COMPUTATION OF TIME from midnight to midnight and from one to twenty-four o'clock, adopted in Spain on the 1st of January, 1901, seems to be a working reform.

It was on the 1st of January also that the Sociedad Geográfica de Madrid became the REAL SOCIEDAD GEOGRÁFICA, and in the reports of its meetings, always held at night, are the recurring formulas:

Abierta la sesión á las 21h 30';
Y se levantó la sesión á las 23h.

These hours are quite as readily understood (in print) as 9.30 P.M., and 11 o'clock, P.M.; but it must be long before the new expressions pass into the daily speech.

THE GEOGRAPHICAL SOCIETY OF LISBON celebrated in April the twenty-fifth anniversary of its foundation. A special commemorative *Boletim* has been issued, giving a brief history of the Society and lists of its officers from 1875 to 1901, with illustrations of its handsome and commodious house.

The membership roll on the 3d of April showed 2,967 names, of which 662 were those of corresponding members.

THE REV. DR. EITEL makes his contribution to the study of *China and the Far Eastern Question* in the reprint of a lecture delivered before the Royal Geographical Society of Australasia (S. A. Branch) at Adelaide, in July last. Dr. Eitel has lived among the Chinese for thirty-five years and has studied with assiduity their life and language and literature, and his conclusion is that when Europeans have learned all they can learn of China they will know very little about the Chinese as a people.

The charity boy is said to have made a similar reflection, after wrestling with the difficulties of the alphabet, and it must be admitted that intimate acquaintance with China and Chinese ways calls for the devotion of a lifetime. How much less than a lifetime will enable an Englishman to sympathize with French, or Italian, or German habits of thought?

Nations, like individuals, rarely learn to know each other well, but they can learn to respect each other's rights and to dwell together with an approach to comity.

Such a relation must seem desirable to Dr. Eitel, yet he permits himself to write of the duty of the allied Foreign Powers to depose Chinese officials, to establish an International Council of State in the Empire, and to take other measures for the government of a country and a people in every way strange and remote to him after the assiduous study of thirty-five years.

Dr. E. Bretschneider, the distinguished Chinese scholar, for many years physician to the Russian Legation at Peking, died in St. Petersburg early in May, at an advanced age. He has written much and well. One of his latest works is a *History of European Botanical Discoveries in China*, in two volumes, published in English at St. Petersburg in 1898. His Map of China, in four sheets, to illustrate this History, was issued at first in 1896. Five supplementary maps were added in 1898, and a second thoroughly revised and enlarged edition of the four-sheet map was brought out in 1900.

General Derrécagaix has made a survey (in *La Géographie*, Nos. 5 and 6, 1901) of the maps of European countries, and their state of advancement in 1900.

The map of Germany is nearly completed, on two scales: one of 1:25,000, as mathematically exact as possible; the other of 1:100,000, more particularly reserved for military purposes.

Austria-Hungary possesses, in the Military Geographical Institute of Vienna, what Gen. Derrécagaix declares to be the most complete and most prosperous geographical establishment existing in Europe. The maps of the empire are on three scales: 1:25,000 for branches requiring complete and rigorously exact details; 1:75,000 for the army and the administration; and 1:200,000 for general purposes. All these, in addition, have been subjected, since 1885, to a process of revision.

The Belgian map is on three scales: 1:20,000, 1:40,000, and 1:160,000, and these undergo constant revision. In addition, Belgium issues geological maps.

Denmark was the first to make official use of contour lines for representing the relief. The scales are three: 1:20.000, 1:40,000 and 1:80,000; this last for the general map of Denmark and Schleswig. A new map on a scale of 1:100,000 was begun in 1890. Gen. Derrécagaix finds that the Danish maps require a too constant use of the magnifying glass.

The Spanish map was begun very late. The first sheet appeared in 1874, and fifteen years later the whole number published was 64.

The scale is 1:25,000. The complete map will consist of 1080 sheets; 110 are finished, for the centre of the kingdom (Madrid, Toledo, Ciudad Real, and Cordova).

Gen. Derrécagaix remarks that there is no general map of Great Britain and Ireland. There is a map of Scotland, a map of Ireland, a map of England, a map of each county, sometimes even one of each parish, and these cannot be brought into unison. There are many scales, varying from 1:528 to 1:633,000. The altitudes are taken from the mean level of the sea at Liverpool; but this does not apply to Ireland. The work of the Ordnance Survey includes:

One-inch scale (1:63,360) England 110 sheets, old series, 360 sheets, new series, two editions; Scotland 131 sheets and Ireland 205 sheets, also in two editions.

Six-inch scale (1:10,560) England 1700 sheets engraved, 7,748 photozincographed, each sheet in two editions; Scotland 2,063 sheets, in two editions; Ireland, Dublin County.

There are also 480 town maps, on different scales. Taken as a whole, the work of the Ordnance Survey is most remarkable; but there are details to be changed, and the lack of unity is to be regretted.

The Italian map is the production of the Geographical Institute, founded at Florence in 1873. Its publications are: sheets on a scale of 1:25,000 and 1:50,000; and

The topographical map on a scale of 1:100,000 in 277 sheets. Of these there remained to publish at the beginning of 1899, 17 sheets for the Peninsula and the whole of Sardinia. Between 1889 and 1893 the Florence Institute published an excellent map in 35 sheets on a scale of 1:500,000.

The Netherlands Topographical Institute has brought out, since 1868: The topographic and military map on a scale of 1:50,000; The hydrographic map of the *Waterstaad;* The chromotopographic, or *Strookkaart*, on a scale of 1:25,000; the *Rivierkaart* on a scale of 1:10,000; and three chorographical maps (one geological) on a scale of 1:200,000. These are all excellent maps; and special mention must be made of the Dutch maps of the colonies.

The Portuguese map is on a scale of 1:100,000, and is completed. There are also sheets on a scale of 1:50,000, and a general map on 1:500,000, and reproductions of this on 1:100,000 are issued.

In Roumania the Geographical Institute of Bucharest has finished a map of the Dobruja on a scale of 1:200,000, and is engaged upon: a map of Roumania on 1:50,000; another on 1:100,000; a general map on a scale of 1:200,000; a fluviometric map on

1:100,000; and a forest map on 1:200,000. A general map on a scale of 1:600,000 was exhibited in Paris in 1900. All these maps, based upon French methods, approach the Austrian in style of execution and constitute a fine national work.

The Russian maps, like the English, present a great variety of scales. The linear measure understood in the statement of the scales is the inch: thus a half verst means one inch, etc.

The most important cartographical document is composed of two maps:

1°—The Topographical map of Russia in Europe on a scale of 3 versts, 1/126,000, to comprise 1,031 sheets (972 for Russia, 59 for Poland). About 512 sheets had been published in 1900;

2°—The special map of European Russia, on a scale of 10 versts, 1/420,000. This numbers 154 sheets;

3°—The map of the Caucasus at 1/420,000;

4°—Another map of the Caucasus at 1/210,000;

5°—A map of Western Siberia at 1/420,000.

Russia possesses also:

The map of the Government of Moscow at 1/84,000, in 40 sheets; Turkey in Europe, map at 1/420,000; Turkey in Asia, at 1/840,000; the Military Districts of Turkestan at 1/1,680,000 and 1/840,000; the map known as that of the Frontier Zone of the Russian Empire, in 37 sheets at 1/1,680,000, reaching from the Caspian to the Pacific; and maps, known as those of the Governments, at 1/210,000.

The systems of projection vary in these maps, and they are measured from different meridians. They are based upon an exact triangulation and geodetic work which has acquired, under the impulse of Struve, a special value. One of the most remarkable operations performed is the measurement of the meridian arc of 25° 20′, from the Frozen Ocean to the Danube.

The principal work of reproduction is on the map at 1/420,000, which covers more than half of Europe. It is engraved on copper, and is brought well up to date. The latest publications show a real progress, notably in chromolithography, and the Russian photographic performance tends to an equality with that of the Vienna Institute.

Servia possesses a map on a scale of 1/75,000, reproduced by zincography and in several colours.

Sweden and Norway maintain complete uniformity in their maps, which are on a scale of 1/100,000 and 1/200,000, besides geological and other general and special maps. The triangulation, which has been finished and revised, is more complete in the south than in

other parts. In the Swedish map at 1/100,000 the roads are well treated, and the relief in rocky districts is shown by horizontal hachures. The map of Central and Southern Norway, also at 1/100,000, is to include 216 sheets. It is not equal to the Swedish map in execution. The maps at 1/200,000, published by the two countries, are engraved on copper and on stone.

The Swiss map is magnificent. The triangulation of Switzerland, interrupted by the events of the French Revolution, was afterwards resumed and finished for the level country in 1820. The Alps followed. In 1832 surveys were begun for a map on a scale of 1/100,000; the atlas known by the name of Col. Dufour, who directed the work. It has been frequently republished. A special map of the canton of Geneva, on a scale of 1/12,500, was finished in 1864.

The most remarkable cartographic work of the country is the topographical atlas, composed of 590 maps on a scale of 1/25,000 and 1/50,000, of which 572 have been published since 1879. The map is perfectly clear and of a scrupulous exactitude.

The characteristics of the Swiss maps are precision in the geodetic structure and the representation of the terrain, the lucidity of all the parts and remarkable artistic execution. They constitute a work of great value which has placed Switzerland, in matters of cartography, at the head of the European nations.

Turkey has undertaken in recent years and brought out in 1897 a map of the environs of Constantinople on a scale of 1/100,000 and one of Thessaly and Epirus on a scale of 1/300,000.

Gen. Derrécagaix concludes his survey with a brief history of the cartography of France from the time of Cassini de Thury, whose great map, on a scale of 1/86,400, was almost finished in 1789. It formed the basis of two others: the map of Louis Capitaine, on a scale of 1/345,600, the first to give the Departments, Arrondissements, and Cantons; and the map *du Génie militaire*, on a scale of 1/864,000.

There follows a list of maps, finished and unfinished, ordered by Napoleon, and his plan for a new map of France, out of which grew the present map of the General Staff (*Carte de l'Etat-Major*). From this have been produced by the Ministry of War fourteen other styles of maps, on scales ranging from 1/20,000 to 1/800,000, an admirable topographical map of Algeria, on a scale of 1/50,000, others of Tunisia and Algeria, Madagascar, Africa, etc. To these must be added the maps published by the Ministries of Commerce,

of the Colonies, of Agriculture, of Public Works, of Marine, the Administration of the Forests, the Cadastral authorities, etc.

The number and the variety of these sources amount to a demonstration that the fundamental topographical map does not supply the documents needed for the public service, and a Central Commission, charged with the study of the question in 1898, has settled upon the style and the details of a new map of France, and these have met with the entire approval of the Academy of Sciences.